THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XX. No. 491—23RD YEAR.] LONDON, AUGUST 1, 1871. [Subscription { 15s. in Advance. / 18s. Credit. } per Annum.] DOUBLE No. Price 1s.

RAMSAY'S NEWCASTLE CANNEL
COAL. Analysis—10,000 cubic feet of gas per ton of coal; 26-candle gas; 13¼ cwt. coke per ton of coal.
RAMSAY'S PATENT CONDENSED COKE.
DO. GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.
GAS-RETORTS, introduced 1828. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.
Manufactories—Derwenthaugh, Swalwell, and Hebburn Quay, near Newcastle-on-Tyne; and London Wharves—Falcon Wharf, No. 80, Bankside; and Honduras Wharf, Cubit Town. Large stocks kept.
Address G. H. RAMSAY, NEWCASTLE-ON-TYNE.

GEORGE GLOVER & CO.,
Patentees of the Standard Gasometers for the Government, and of the
IMPROVED DRY GAS-METERS.

These Meters are warranted to measure correctly and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured.
To meet the increasing demand, G. GLOVER AND Co. have just entered on possession of extensive premises adjoining their present Works in Ranelagh Road, and they are now prepared to execute promptly, orders to any extent. They keep in stock all sizes of Meters up to 200 lights. In cases of haste, on the receipt of a telegram early on one day, their Meters can be delivered next day in any part of England, and in the large towns in Scotland.
Particulars and lists of prices forwarded on application to—
RANELAGH ROAD, PIMLICO, LONDON, S.W.;
236, GEORGE STREET, GLASGOW;
OR
15, MARKET STREET, MANCHESTER.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, NEAR NEWCASTLE-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and OTHER OBJECTS in FIRE-CLAY," and they have also been awarded in the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts in the United Kingdom; and orders for Fire-Clay Retorts of all shapes and dimensions, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Coal Office,
QUAY SIDE, NEWCASTLE-ON-TYNE.

FIRST PRIZE IN THE PARIS EXHIBITION.
JOHN RUSSELL and CO.,
THE OLD TUBE-WORKS,
CHURCH HILL, WEDNESBURY;
ALMA WORKS,
WALSALL, STAFFORDSHIRE;
and 69, UPPER THAMES STREET, LONDON,
Original Manufacturers of Wrought-Iron Gas-Tubes, and Holders of the present Patents; Inventors and First Makers of LAP-WELDED FLUES for Steam-Boilers.
J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water, and the largest orders may be executed in a few days.
Gun Metal, and all other kinds of Cocks, Stocks, Dies, and Taps, Galvanized Tubes, &c.
N.B.—All goods thoroughly tested before sent out, and warranted.

JOHN BENT & SON,
WET AND DRY GAS-METER
AND
STREET-LAMP
MANUFACTURERS,
BELL BARN ROAD, BIRMINGHAM.
ESTABLISHED 1830.
All materials found for the alteration of Public Lamps for lighting with the Rod. Regulators with Lava Burners.

BLAYDON BURN AND LOW BENWELL FIRE-CLAY RETORT AND FIRE-BRICK WORKS,
NEAR NEWCASTLE-ON-TYNE.
WILLIAM COCHRAN CARR begs most respectfully to thank the Metropolitan, Provincial, and Continental Gas Companies for their patronage for several years past, and to intimate that he has rebuilt and enlarged his extensive premises for the manufacture of CLAY RETORTS; and that he is now prepared to execute the largest orders with punctuality and despatch. Orders for FIRE-CLAY RETORTS, of all shapes and sizes, FIRE-BRICKS, and all other articles in Fire-Clay, executed on the shortest notice, and on the most reasonable terms.
London Agents: JAMES LAWRIE & CO.,
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SCOTTISH CANNEL COAL.
J. & W. ROMANS, Consulting Gas Engineers and Coal Factors, of Edinburgh and London, CONTRACT for supplying any quantity of COAL and CANNEL.
They are also Contractors for leasing Gas-Works, for supplying, erecting, or repairing gas apparatus and fire-clay goods.
Messrs. ROMANS, being lessees of several Gas-Works, have their Cannels tested in the ordinary working process, thus securing for their customers a guarantee beyond mere laboratory experiments.
Analysis, prices, and other information will be forwarded on application to their Offices, 8, Forth Street, EDINBURGH; 1, Walbrook, Mansion House, LONDON, or to the "Crown Wharf," Thomas Street, Limehouse, LONDON, where stocks of house, steam, and gas coal are always on hand.
Coal, machinery, fire goods, &c., shipped to all parts of the world.

LESMAHAGO GAS COAL,
AUCHINHEATH COLLIERY.
LESMAHAGO N.B.

JAMES FERGUSON & CO.
LESSEES SINCE 1832.
LONDON AGENTS:
JAMES LAWRIE & CO.,
63, OLD BROAD STREET, E.C.
CONTINENTAL AGENTS:
LA COUR & WATSON,
LEITH.

CROLL'S DRY GAS-METER,
(INVENTED & PATENTED IN 1844,)
COMBINING ALL THE LATEST IMPROVEMENTS,
MANUFACTURED ONLY BY
THE GAS-METER COMPANY, LIMITED,
238, KINGSLAND ROAD, LONDON, N.E.
PRIZE MEDALS.
LONDON, 1851;
NEW YORK, 1853;
PARIS, 1855.
PRIZE MEDALS.
LONDON, 1862;
DUBLIN, 1865;
PARIS, 1867.

MEDAL AWARDED, EXHIBITION, 1862, "FOR GOOD WORK."
THE IMPERIAL TUBE COMPANY, BIRMINGHAM,
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS, BRASS & COPPER TUBES,
GALVANIZED & GLASS ENAMELLED TUBES & FITTINGS,
LAP-WELDED IRON & BRASS BOILER-TUBES, ETC., ETC.
Twyere Coils for Blast Furnaces, Boring Tubes, Core Bars, Gun-Metal and other Cocks, Boiler Mountings, &c.
HUGHES'S PATENT TAPS FOR HIGH PRESSURES.

C. & W. WALKER'S

DOUBLE-FACED GAS-VALVES FOR LARGE MAINS.

These Gas-Valves for large bores are specially constructed of unusual strength and solidity. The Valve itself is a rigid wedge of cast iron, having two perfectly scraped surface facings, fitting between the two in the body, which are also surfaced. They are guaranteed absolutely tight under any chemical or other test for mains of the largest diameter, at a very moderate price.

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HENRY HOWARD & CO.,

COOMBS WOOD PATENT TUBE-WORKS.

OLD HILL, near DUDLEY,

MANUFACTURERS OF

HOWARD'S PATENT IMPROVED WROUGHT-IRON TUBES,

FOR GAS, STEAM, AND WATER;

Also ORDINARY WELDED WROUGHT-IRON TUBES and FITTINGS,

FOR GAS, STEAM, & WATER, EITHER BLACK, GALVANIZED, OR ENAMELLED.

CORE BARS FOR IRONFOUNDERS, STOCKS, TAPS, AND DIES, IRON COCKS, &c.

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SILVER MEDAL, PARIS EXHIBITION, 1867.

LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,

MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS

For Gas, Steam, Water, &c.

SOLE LICENSEES AND MANUFACTURERS for the United Kingdom of

THE LAVENANT PATENT ENAMELLED TUBES AND FITTINGS.

LAP-WELDED IRON & HOMOGENEOUS METAL TUBES

For Locomotive, Marine, and Stationary Boilers.

Boiler-Tube Ferrules, Gun-Metal Gland Cocks, Water-Gauges, Whistles, &c.; Stocks, Taps, and Dies for Screwing, and Gas-Fitters Tools of all kinds.

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WILLIAM INGHAM AND SONS,

WORTLEY FIRE-BRICK AND RETORT WORKS,

Near

Leeds.

W. INGHAM and SONS, having for many years been extensively engaged in the Manufacture of

RETORTS AND FIRE-BRICKS FROM THE CELEBRATED WORTLEY FIRE-CLAY,

beg to call especial attention to their RETORTS, which have for many seasons proved to be unsurpassed in quality by any in the Kingdom, their FREEDOM FROM CRACKS and the ADHESION OF CARBON rendering them worthy the attention of all parties interested in the making of Gas.

The Works are of such magnitude as to ensure the prompt execution of orders to any extent.

Estimates for Setting, or Bricklayers sent when required.

GAS OVENS IN SEGMENTS OF EQUAL QUALITY.

A large Stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all Sizes kept in London at Mr. ALFRED WILLIAMS, Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.

N.B.—*Export orders continue to have prompt attention.*

TRADE MARK.

THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

CROWN TUBE-WORKS,

WEDNESBURY, STAFFORDSHIRE.

WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.;

GAS-FITTERS TOOLS, VALVES, COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM,

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

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ENGINEERS, WET AND DRY GAS-METER MANUFACTURERS,

BRASSFOUNDERS, & GAS APPARATUS MANUFACTURERS,

FOUNTAINBRIDGE WORKS, EDINBURGH.

SOLE MANUFACTURERS OF

Peebles' Patent Wet and Dry Gas-Meters in Tin-Plate Cases, with Tongue and Groove Joints.

IMPROVED WET METERS IN CAST-IRON CASES.

STATION-METERS, GOVERNORS, EXPERIMENTING METERS, PHOTOMETERS, PRESSURE-GAUGES, &c.

C. & W. WALKER'S GAS-VALVES.

These celebrated Valves of all kinds have been in use for so many years, and are so well known, that a description is unnecessary. They are made of all kinds to suit all the requirements of engineers.

Midland Iron-Works, Donnington, near Newport, Shropshire; 8, Finsbury Circus, London.

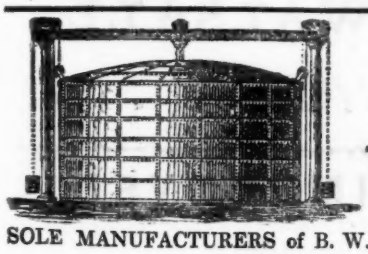
TO GAS COMPANIES, ENGINEERS, AND MACHINISTS.

NEW LUBRICATING OIL.

This Oil is suitable for every kind of machinery, being entirely free from anything liable to produce corrosion, and is equal in lubricating power to sperm or lard oil (though supplied at half the cost).

It is prepared in two consistencies—viz., LIGHT MACHINE OIL, for machinery where the pressure is moderate and the motion rapid. HEAVY MACHINE OIL, on machinery where the motion is comparatively slow. *Four-gallon Samples, carriage free, can included, for* £1 1*s.*

WALTER CARSON & SONS, Belle Sauvage Yard, Ludgate Hill, London, E.C.; 21, BACHELORS WALK, DUBLIN.



IMPROVED GAS APPARATUS,

FOR CITIES, TOWNS, VILLAGES, &c.,

INVENTED AND MANUFACTURED BY

W. C. HOLMES & CO.,

WHITESTONE IRON-WORKS, HUDDERSFIELD.

SOLE MANUFACTURERS of B. W. THURSTON'S IMPROVED SCRUBBER, CONDENSER, and WASHER, in use in many of the principal Gas-Works on the Continent.

PATENTEES of the IMPROVED COMBINED PURIFYING APPARATUS, so eminently adapted for Exportation.

ESTIMATES, PLANS, and SPECIFICATIONS PREPARED for BUILDINGS and APPARATUS.

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*** *Please address letters to Huddersfield.*

REFERENCES TO NEARLY 300 GAS-WORKS.

THE FARNLEY IRON COMPANY, LIMITED,

FARNLEY, near LEEDS,

Possess special advantages for the prompt and efficient execution of large orders for

FIRE-CLAY RETORTS & FIRE-BRICKS,

Of every shape and size, and of the best quality; also for their *other productions* in Fire-Clay and Terra-Cotta, including their well-known White and Coloured GLAZED BRICKS.

The F. I. Co. have the exclusive right to make and sell Fraser's Patent "Ribbed" Retorts in Fire-Clay.

Apply as above, or at their Offices,

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E. J. & J. PEARSON,

DELPH & TINTAM ABBEY FIRE-CLAY & BRICK WORKS,

STOURBRIDGE,

PROPRIETORS OF

BEST GLASS-HOUSE POT & CRUCIBLE CLAY;

MANUFACTURERS OF

GLASS-HOUSE POTS, CRUCIBLES, GAS-RETORTS, & FIRE-BRICKS OF EVERY DESCRIPTION.

FLETCHER AND MURPHY,

GARRATT STREET WORKS, OLDHAM ROAD, MANCHESTER;

Manufacturers of

IMPROVED CONSUMERS WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

AND

IMPROVED DRY GAS-METERS;

STATION-METERS OF ALL SIZES, with PLANED JOINTS;

GOVERNORS, PRESSURE AND EXHAUST REGISTERS, TEST HOLDERS,

And all kinds of Experimental Gas Apparatus.

1862.

PATENT ANTIMONY PAINT.

MADE ONLY BY

GEORGE HALLETT & CO.,

296, ROTHERHITHE, LONDON, S.E.

CLASS II.

This Paint having been in general use over nine years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (30s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.

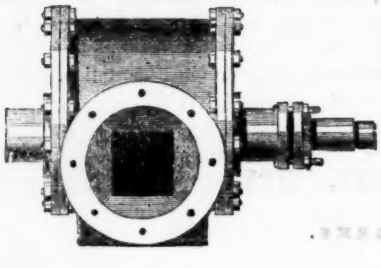
Reference is kindly permitted by the Engineers of the City of London, Commercial, London, and Surrey Consumers Gas Companies, who pronounce it the best Paint known for their purposes.

N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs about 20s. per cwt., as compared with White Lead at 30s. per cwt.; a similar economy arises from its use in Steam and Gas Joints, for which purpose it is superior to White Lead.

LAMBERT BROTHERS, WALSALL.

ALPHA TUBE & FITTING WORKS

BEALE'S GAS-EXHAUSTER IMPROVED.



FROM 250 TO 250,000 CUBIC FEET PER HOUR.

Since Mr. BEALE'S retirement, the Oldest Makers are

J. BURTON, SONS, AND WALLER,

MAKERS OF ENGINES, MACHINERY, and IRONWORK for GAS-WORKS.

Efficient and durable TAR, LIQUOR, and SYPHON PUMPS.

GAS-VALVES in stock, 2 inches to 30 inches.

SELF-ACTING BYE-PASS VALVES, with Lid and Relieving Lever,

ROTATORY, TUMBLER, and CAPILLARY WATER DISTRIBUTORS for SCRUBBERS.

EXHAUSTERS from 3000 to 30,000 per hour in stock.

HOLLAND STREET, BLACKFRIARS, LONDON, S.E.,

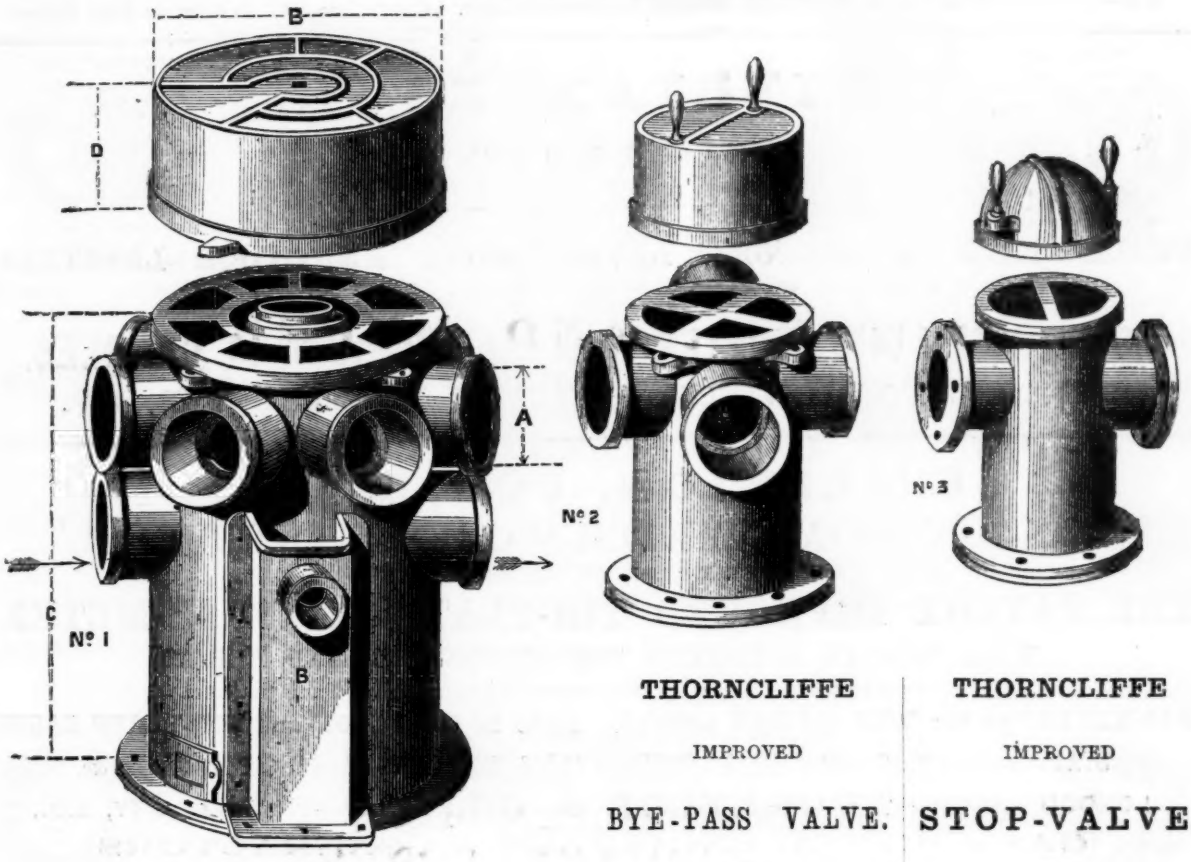
Between Blackfriars' and Southwark Bridges.

THE THORNCLIFFE IMPROVED CENTRE-VALVE,

MANUFACTURED BY

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.



Sizes of the

THORNCLIFFE IMPROVED CENTRE-VALVE.

		Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
A	Bore of Pipe...	4	5	6	7	8	9	10	12
B	Diam. of Body.	16	20	23	26	28	31	34	40
C	Height of Tank.	33	35	38	43	46	48	51	56
D	Depth of Cover.	8	9	10	11	12	13	14	16
	Total height...	41	44	48	54	58	61	65	72

THORNCLIFFE IMPROVED BYE-PASS VALVE.

SIZES

From 3 ins. upwards.

THORNCLIFFE IMPROVED STOP-VALVE.

SIZES

From 3 ins. upwards.

In all cases the Covers are cast heavy enough to resist any required pressure.

The advantages derived from the adoption of these Valves are so manifest and cardinal that in the immediate character of the change—the simplicity of the machine—the facility affording for cleaning out connexions between Valve and Purifier—the perfect collection and delivery by suitable overflow of the ammonia, at a greatly diminished depth from ground-line over the old form of Valve—the advantage of connecting on the same level, and at any angle, or opposite to each other, the inlet and outlet pipes without dip or rise—the clear acquisition of space in the purifying-house, by being able to place the boxes nearer together, the new Valve being entirely under the floor—and lastly, though of the greatest importance, the passage of crude and unpurified gas during the change is minimized to the merest fraction, thus preventing the fouling by impure gas the delicate machinery and easily affected exposed movements of the station-meter, thereby preventing the introduction of the enemy (unpurified gas) into the gasholder. Also a dead abutment is offered to all back pressure, imparting thereby to the gauges, governors, and hydraulic seals, a steadiness of action never realized with the once famous, but now fast becoming obsolete, Hydraulic Centre-Valve.

These Valves may be made of any size to suit any position of boxes, to stand any amount of pressure, warranted and tested with gas before leaving the manufactory, prepared to work any number of boxes in rotation—say, two, three, four, five, six, or eight—and for all Valves above 12-inch ports a suitable rack-and-pinion movement is attached if preferred. These Valves (specially arranged) are applicable to inlet or outlet pipes of gasholder, to act as Bye-pass Valves to meters, governors, exhauster, condensers, scrubbers, washers, driers, and duplicate systems of hydraulic main; also to act as Stop-Valves on special mains about the works. Where it is important no impediment be offered to tar or ammoniacal liquor, the same having uninterrupted flow to the general tar-well on the works, and for which purpose the slowly changed, often disordered, and at all times obstructive Slide-Valve (challenging the best of them) is superseded by the exceedingly simple, instantaneously changed Dome-Top Valve, which also carries so marked an index, whether open or shut, at any distance from close observation, providing the Valve can be seen at all. See sketch in perspective, No. 3.

London Office—34, LONDON WALL, MOORGATE STREET, E.C.

JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS of FIRE-BRICKS, LUMPS, & TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

PARIS, 1867.

CLASSES 24 and 53.

WILLIAM SUGG,

GAS ENGINEER.

LONDON, 1862.

CLASSES 13 and 31.

PUBLIC LAMP GOVERNORS, LEVER COCKS, AND POLE LIGHTERS,

LAMP METERS AND BOXES.

LOWE'S JET PHOTOMETERS CAN NOW BE RATED TO 14 CANDLES.

VINCENT WORKS, VINCENT STREET, WESTMINSTER, S.W.

FULLERTON, SON, & CO.,

LONDON ROAD METER-WORKS, EDINBURGH,

SOLE MANUFACTURERS OF

THE PATENT IMPROVED TIN-PLATE DRY GAS-METER,

WITH SPECIAL FACILITIES FOR ADJUSTMENT AND REPAIR,

The principal parts of the mechanism being accessible by the removal of a single Screw.

GAS-METERS on the WET and DRY principles made in CAST-IRON and TIN-PLATE CASES.

STATION-METERS, GOVERNORS, EXPERIMENTAL & TEST METERS, GAS APPARATUS, &c.

LONDON AGENTS: THORNELOE & CO., 34, LONDON WALL CITY, E.C.,

GAS & WATER ENGINEERS, & CONTRACTORS

FOR GAS & WATER WORKS APPARATUS.

SHOW-ROOMS AND WHOLESALE WAREHOUSE FOR

Wrought-Iron Tubes and Fittings for Gas, Water, and Steam; Chandeliers, Pendants, Lamps and Brackets; Plumbers Work, Water-Closets, Pumps, &c.; Lead, Composition, Brass, and Copper Tubes.

METERS SUPPLIED TO ORDER FROM STOCK.

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS AND COLLIERIES,

NEAR SHEFFIELD.

CELEBRATED SILKSTONE GAS COALS.

Analyses by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

Description.	Cubic Feet of Gas per Ton of Coals.	Illuminating Power in Candles.	Coke per Ton of Coal used. Cwt.	Ash in Coke per Cent.	Sulphur in Coa per Cent.
Best Silkstone . .	10,900	17·0	12·8	2·6	1·7
Norfolk Silkstone . .	11,000	15·94	12·5	4·4	1·64
Silkstone Brights . .	11,500	14·5	12·6	7·4	1·85
Silkstone Nuts . .	10,800	15·85	12·66	6·0	0·69

NOTE.—The illuminating power of the Gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

OFFICES, 34. LONDON WALL, CITY, E.C.

TANGYE BROTHERS & HOLMAN,

10, LAURENCE POUNTNEY LANE, LONDON, E.C.;

And BIRMINGHAM (TANGYE BROS.), CORNWALL WORKS, SOHO.

SOLE MAKERS OF

MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS.

Over 1000 of the Patent Retort-Lids and fastenings already supplied to the great works of The Gas Company at Beckton.

Several hundreds in use at the works of the London Gas Company.

FIG. 1.

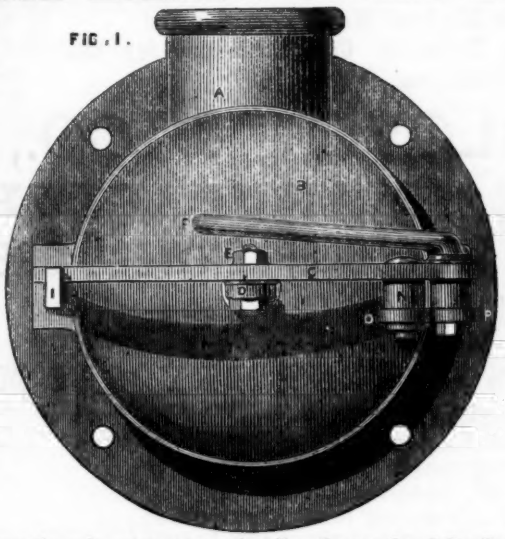
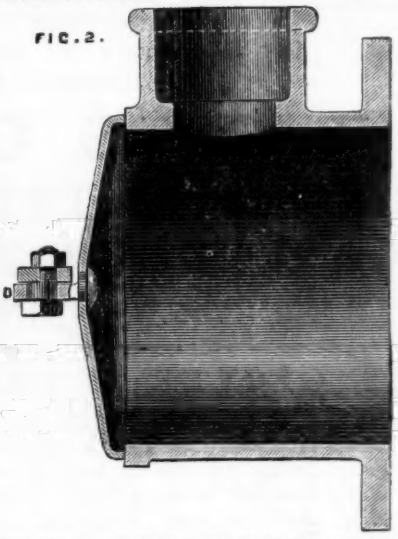


FIG. 2.



Adopted in the Gas-Works at

LIVERPOOL,
DUBLIN,
NOTTINGHAM,
ST. ALBANS,
BURSLEM,
BOURNEMOUTH,
WINDSOR,
BOSTON,
&c., &c.

The expensive and cumbersome process of sealing the mouths of Gas-Retorts by means of luting the Lids with lime and other materials hitherto used for that purpose, is henceforth rendered unnecessary, and will be superseded by the very efficient method shown in the accompanying illustrations.

The Self-Sealing Lid reduces labour, saves wear and tear, obviates all the inconvenience and discomfort consequent on the preparation of luting, and effects a great reduction in the working expenses. The cost attending the process of "luting" in several large gas-works exceeds £1000 per annum, ranging in various works from 20s. to 35s. per mouthpiece.

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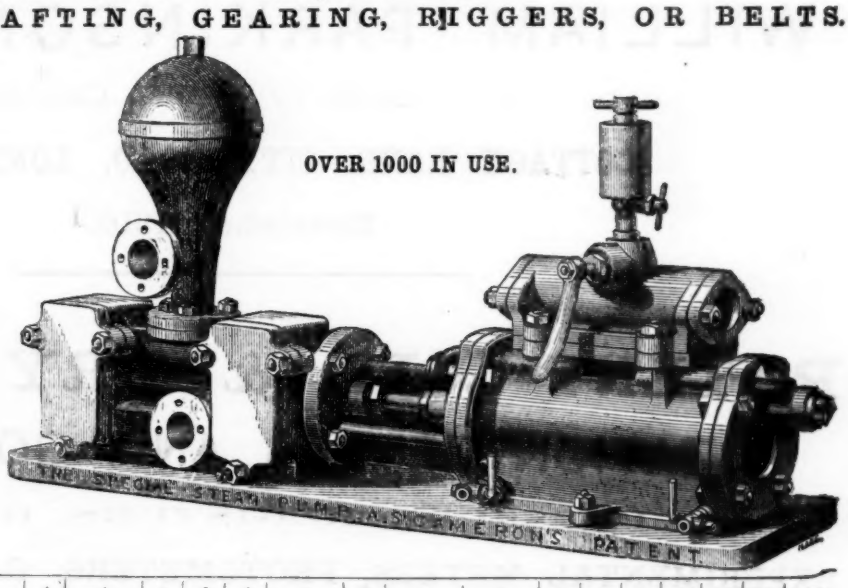

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CONTENTS.

Notes upon Passing Events:— PAGE

Public Gardens in the Metropolis . . . 573
The Conservation of Epping Forest . . . 573
The Progress of Railway Improvements . . . 573
Reform of Legal Education . . . 574
Need of good School-Books . . . 574
The Colonial Congress . . . 574
Edinburgh Water Supply . . . 574

Circular to Gas Companies:—

Municipal Corporations (Borough, &c.) Funds Bill . . . 575
The Fifth Report of the Standards Commission . . . 575
Report of the Paris Gas Company . . . 575
The Bill of the Alliance and Dublin Gas Consumers Company . . . 576
The Report of the European Gas Company . . . 576

Correspondence:—

The Manufacture of Sulphate of Ammonia . . . 576

Parliamentary Intelligence:—

Progress of Bills in House of Lords . . . 576
Progress of Bills in House of Commons . . . 576
House of Commons Committee—Edinburgh and District Water Bill . . . 576

Legal Intelligence:—

Guildhall Police Court—The Gaslight and Coke Company *v.* Docking . . . 582
Lancaster Assizes—Bootham *v.* The Mayor and Corporation of Burnley . . . 585
Armagh Assizes—Cochran *v.* Lutton . . . 585

Miscellaneous News:—

Meeting of the European Gas Company . . . 585
Metropolis Water Supply—
Metropolitan Board of Works . . . 587
Court of Common Council . . . 587
Dr. Letheby's Report on the Quality of the Gas supplied to the Metropolis 587
Dr. Whitmore's Report on the Quality of the Water supplied in St. Marylebone, in June, 1871 . . . 587
Dr. Whitmore's Report on the Quality of the Gas supplied in St. Marylebone, in June, 1871 . . . 587
Colombo Gas and Water Company, Limited . . . 587
Hollinshead's Patent Recessed Cone-Valve . . . 588
Lecture on the Analysis of Coal Gas, by H. Letheby, Esq. . . . 588
West Surrey Water Company . . . 590
Halifax Water Supply . . . 590
Workmen's Treat—Crystal Palace District Gas Company . . . 591

TO CORRESPONDENTS.

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The subscription is 15s. per annum if paid in advance during the month of January, or 18s. credit, in two sums of 9s. each, payable in July and January of each year.

Subscribers who have not paid their subscriptions for the year 1870, or or any previous years, are requested to remit the same forthwith to the publisher, in order to prevent any interruption in the regular delivery of the JOURNAL.

All communications for the Editor should be addressed "No. 42, Parliament Street, London, S.W."

Remittances for subscriptions and orders for advertisements should be addressed to the publisher, William B. King, 11, Bolt Court, Fleet Street, London, E.C.

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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 1, 1871.

Notes upon Passing Events.

THE cause of public gardens and open spaces gains ground daily. Recently a claim has been made for increasing the playgrounds of the poor children in the heart of London. Parks and commons are excellent things in their way, but the most pressing demand is for room where the children may play after they have all been swept into schools under the new Acts, and where their parents also take exercise. It would cost too much money to pull down buildings for the purpose; the only available plan is to utilize open spaces, however small, not as yet occupied. We have often pointed out that many disused churchyards, now treated as the private property of abutting houses, might be turned to pleasant purposes. The benchers of the two Temples, under the instigation, we believe, of the late Mr. Broom, have long kindly thrown open their pleasant gardens to all who choose to behave themselves. The benchers of Gray's Inn have been asked to do the same. If they would, the boon would be greater, because the adjacent poor inhabitants are far from any open space like Trafalgar Square or the Embankment. Lincoln's Inn Fields is one of the most spacious gardens in London. It is the private property of the residents of the Square, who were once numerous. At present there are very few houses not turned into chambers; the families must be very few, if any. It is commonly understood that the freeholders were willing to give up the gardens as a site for the law courts, if public opinion in favour of open spaces had not interposed difficulties. The Metropolitan Board, which has successfully negotiated the surrender of Hampstead Heath to public use, might, with credit, endeavour to obtain free admission to Lincoln's Inn Field gardens from daylight to dark. It would be a boon worth paying a reasonable sum for, and the expense of a policeman to keep order. We would suggest that a committee be appointed by the Metropolitan Board to ascertain what additional open spaces in disused churchyards and square gardens can be obtained in the most crowded districts of London, and on what terms. Near Russell Square there is a large unused burial-ground. To call upon the inhabitants of the squares to make free the joint-stock garden in front of their houses—the garden in which their children play, often without servant or governess—to the free access of gutter children, is as absurd as to ask for the use of their back yards. The square of the garden is part of the consideration in the rent or purchase of the house, and therefore as much the private property of the tenants as if a proportionate slip had been walled in behind each house. No parallel is to be found in the squares of Paris, where the gardens were from the first dedicated to the public. But there are other gardens, like those of Lincoln's Inn Fields, where houses, which once had nurseries and school-rooms, are now turned into offices and chambers. As for the disused churchyards, they should be levelled, and the names on tombstones transferred to the walls. It is a mistake to create elaborate gardens, in which children must be confined to gravel walks. The arrangement of Bunhill Fields is one huge mistake. We repeat, to begin with, we require a thorough survey and report from the surveyor or architect of the Metropolitan Board and the Commissioners of Sewers, showing what is available. The question of cost may be afterwards discussed.

Epping Forest, thanks to continuous agitation, is safe from the illegal encroachments which have, in the course of this century, absorbed so many acres into building and pleasure grounds. The lords of the manors and the commoners have rights that must be valued and paid for. We have a specimen of the progress of public opinion in the staunch Conservative, Sir Antonio Brady, appearing in the character of the—shall we say Jack Cade or Wat Tyler of Epping Forest?

Railroad property is steadily advancing in value with the progress of the nation, and consequently there is a revival of small schemes for perfecting communications. For the present we hear nothing of competing lines. Traffic questions are settled after short discussions, or fights by arbitration. In the Metropolis the inclination of active directors turns towards increasing and feeding the season-ticket subscriptions. This is the secret of the vast outlay which the impoverished Great Eastern is making, in order to remove its main station from Shoreditch to Liverpool Street and Broad Street, within two minutes of the Bank, and communicating with all the Underground system. The same idea compels the impecunious London, Chatham, and Dover to make a short direct cut from Ludgate Hill to the Crystal Palace and Sydenham Hill, and to originate the grand scheme, which sounds too good to be true, for a central station of all the main lines, adjacent to the Holborn Viaduct—this viaduct, with its branching streets, having alone made such a station possible. We are now finding out how much better the public is served by our free system, with all its shortcomings, than by the close monopolies of the continental system, where the railway is seldom improved after it is once opened. Neither on a Government line nor on a monopolist line, like the Northern of France, is there any influence to promote station improvements or short branch lines, as the visitors to Boulogne and Calais soon find out after leaving Folkestone and Dover. We must go to Ryde, in the Isle of Wight, to see anything like obstructive French railway management. The *Saturday Review* points out, with a good deal of force, that we are now discovering the folly of the Act by which railroad dividends were limited to 10 per cent., under threat of being appropriated by Government. To limit the dividend of a company engaged on public work is to discourage reproductive improvement, and encourage unprofitable expenditure.

It is to the credit of the great luminaries of the law that they alone, of all the professions and callings, are earnest in schemes for reforming their own profession. The military clubs hate all change, and only ask for more pay, more promotion, less to do, and to be left alone by civilians, from the late Lord Herbert down to the present Lord Northbrook. The only idea agriculturists have of reform is taxing other classes for their own benefit. Manufacturers, as we pointed out in our remarks on patent laws, as a rule, hate and discourage every invention that is likely to disturb their mode of doing business. The leading lawyers alone, of the present generation, seem to handle our legal system with the investigating indifference of a great anatomist dissecting and lecturing on a corpse. How changed from the good old days when Brougham was cursed by bench and bar as a sacrilegious law reformer. It was only the other day the Conservative Lord Cairns was advocating the fusion of law and equity. A public prosecutor looms not far off, and perhaps the next generation will see our commercial laws reduced to an intelligible system. When, the other day, Sir Roundell Palmer brought forward his motion in favour of a law university, those who opposed his scheme did not deny or oppose legal education. Mr. Jessel is as great an enemy as Sir R. Palmer to a system under which men are called to the bar without the slightest legal knowledge; but he appears first as the advocate of the inns of court, to whom he wishes to give another chance, as the guardians of legal education; and next as the opponent of a plan which would make the lectures of authorized professors the indispensable passport to the status of a barrister or attorney. The benchers of the inns of court must speak now, or be for ever silent. A regular legal education the legal public insist on. This may be secured either by a legal university enforcing a course of study, attendance at certain lectures, plucking the incompetent, granting degrees and honours to merit; or by leaving students to work as they pleased, but making admission to the bar dependent on an examination by an independent board. The latter course is advocated by Mr. Jessel. No doubt clever men can do more with books than lectures, if they have the run of a library. Lectures originated in times when books were scarce. They are only valuable when the lecturer is a man of more than average original powers. The public outside the profession are more interested in the appointment of public prosecutors and the consolidation of existing Acts of Parliament than in a system of legal education which will profit the next generation. But, before we get to such practical reforms, there are two or three big questions to be got out of the way. Next session the colonels will not be bound to talk against time, but there will be the licensed victuallers.

Sir John Lubbock, in his speech in favour of a higher education for the masses, touched on the wretched handbooks of useless knowledge on which the time of schoolboys and girls is now wasted. We have already noticed the mischievous trash prepared as trade speculations by religious societies, like that for the Diffusion of Christian Knowledge. If one of the numerous "Reviews" would take up the subject, and give a notice of the books issued by these societies, with extracts, the managers might be shamed either into leaving publication out of the region of tracts alone, or into doing it better. Not one of the least useful effects of the School Board system will be the destruction of religious jobs in books. Good school-books are as much needed as good schoolmasters and schoolmistresses. Let the religious tract societies continue to sell tracts and deal in stationery at the expense of their subscribers, but let them leave history, biography, geography, and natural history alone. Argument will have no effect, but ridicule, with the advice and example of the London School Board, may cure the disease.

A congress of colonial crotcheteers is being held—we were nearly writing quacks—for the ostensible purpose of teaching colonists how ill they are used, and promoting a general federation and representation in the Imperial Parliament of our colonies. There is to be one council, one army, one navy, and tariff for every legion, from the Mauritius to New South Wales. If the congress have any effect, it will give a berth to one or more briefless barristers. Real colonists take no part in this performance. Two or three retired and settled in England appear, in order to obtain a little passing notoriety. It is quite useless to cry over spilt milk. There is no doubt that under a good principle, ridden to death, we have surrendered to colonies, with no more population than Harrow or Ealing, the control of waste lands larger than Ireland, worth millions, and given them representative institutions which work like a farce at the Haymarket. But this is done, and cannot be undone. The North-American Federation walks almost alone, and wants nothing from us but our credit for a loan. The Australian colonies are practically independent of the mother country, have not the slightest sympathy with the American colonies, and cannot at present agree among themselves on a federative union. That must come sooner or later. They would be very glad to have our military and naval forces stationed amongst them, and paid for and fed at our expense; but they insist on making the laws, custom, and other duties that suit them, as do the Canadian Dominions. The crime alleged against us by the grievance-mongers is that England declines to spend money on colonies where we have no control over the finances or tariffs. In New Zealand we declined to keep up an army to defend colonists four times more numerous than the savages who attacked them. While in a state of minority, we paid the debts of colonists and protected them; now they are of age, and in possession of their fortune, they must pay their own debts. Colonial representation in an Imperial Parliament would be a needle in a truss of hay; a Colonial Council where the Canadian would sit beside representatives from Tasmania, Demerara, South Africa, and Ceylon, without a thought in common, would be a farce. To colonists we owe the sympathy of blood, to be shown, in time of special difficulties, by loans and guarantees; also, in time of war, by naval assistance; but the best thing the Colonial Office can do is to leave colonists alone, be civil when colonists call, and have a chief who can ask the influential, who come over to visit the mother country, to dinner. When Mr. Amos entertains the congress with a paper on the ill usage Maories have received from the colonists, we may guess how the proceedings of this self-elected society will be received in that colony. The Americans have a good word to express the meaning of the papers and orations of the Colonial Congress—gas! A gas that does not illuminate.

The contest on the Edinburgh Water Bill will be memorable in the annals of such proceedings. Edinburgh is the capital of Scotland, but, unfortunately, makes but little progress. It has a royal palace, seldom tenanted, a flourishing university, and is, of course, the centre of the legal business of the country. But it has no, or scarcely any, manufactures, and holds, in fact, in Scotland, just the same rank as Oxford would if it were the capital of England instead of London. Edinburgh has, however, an ambitious Town Council, who look with some degree of envy on the neighbouring upstart city of Glasgow. One of the glories of this latter city is its water supply, drawn from one of the most romantic lakes in Scotland, and, at all events for the present, practically unlimited in quantity. The water supply of Edinburgh, on the contrary, while admitted to be of excellent quality, has been rather limited in quantity, owing, it is alleged—and the fact has not been denied—to excessive waste. Now, shutting their eyes to the circumstance that a supply of 50 gallons of soft water per head per day does not save Glasgow from being one of the most unhealthy towns in the United Kingdom, the cry of sanitarians in Edinburgh is still for more water, and soft water. A tap in every room to the uppermost flat in the Old Town, and one or two stand-pipes in every wynd and close, to keep those delightful precincts in a continual state of sloppiness, involving a distribution of about 100 gallons per head per day, is all that is considered necessary to make their city as healthy as it is picturesque. And then there is the rivalry we have hinted at. Why should not the modern Athens draw its water supply from a lake famed in song, and have its long-drawn tunnels and elevated aqueducts to exhibit to remote ages? Clearly there was no reason, if the citizens did not decline to supply the needful. But the citizens did object both to the outlay and the quality of the proposed supply. The water of St. Mary's Loch, although it may beautifully reflect the figure of the floating swan, is not a delightful water to look at when removed from the lake. It has a colour a toper would not quarrel with, for it might almost delude him into the notion that he was drinking pale ale. Nor would an inhabitant of the Old Town object to it on the score that it was infested with fleas. But the respectable inhabitants were strongly opposed to the new source, and in the end succeeded in defeating the Town Council in their attempt to force it upon the city. We must congratulate them on the result, and the citizens of Edinburgh may be thankful that there is a House of Lords. If an extension of the present supply be needed, any quantity of water that may be required can easily be gathered on the Pentland Hills, and conveyed to the city by existing channels. The scientific part of the discussion will attract a good deal of attention. The dispute resolved itself into a controversy as to the relative merits of a moderately hard and of a soft water for a town supply; and we must say that the facts and arguments brought forward by the advocates of a moderately hard water have never been answered. The fact is patent that the death-rate of the population is highest in towns supplied with the softest water. Soft water may be advantageous for some manufactures; but beyond a few breweries, and some small manufactories of soporific chemicals, representing, we might almost say, the influences which alternately act on the Town Council, Edinburgh has no industries. The water is required for domestic purposes, and for those the present supply is admirably suited. Let the inhabitants, by all means, have enough of it; but for this end little more may be necessary than to repair defects, which, it is only fair to say, the Town Council have in part inherited.

Circular to Gas Companies.

THE Municipal Corporations (Borough, &c., Funds) Bill has made no progress since our last. An attempt was made to get it through committee in the small hours of Saturday last, which was met by a motion that the House resolve itself into committee that day three months. The discussion, however, was stopped by a count out, and the further consideration of the Bill is adjourned. Notice has been given by Mr. Craufurd and others of some very important amendments, which will probably give rise to considerable discussion whenever the Bill does get into committee. The chief of these amendments are as follows:—A double proviso to clause 2, to be moved by Mr. Craufurd, which reads thus:—"Provided always, that no such expense as heretofore mentioned "shall be incurred in or about promoting or furthering any Bill "in Parliament for the purpose of enabling any governing body "to purchase by compulsion . . . the undertaking of any "gas or water company, nor in or about promoting or furthering "any Bill in Parliament for the purpose of enabling any governing "body . . . to supply gas or water in any district within "which any company is now supplying gas or water, as the case "may be: Provided that such company is able and willing "to lay on gas or water proper and sufficient for all reasonable "purposes for which it may be required by the said governing "body, and upon such terms as shall be settled, in case of dif-"ference, by arbitration in the manner mentioned in the 75th sec-"tion of the Public Health Act, 1848." In addition to this, Mr. Craufurd is to move the omission from clause 3 of the words "containing a population of less than 3000 inhabitants," rightly considering, as we urged in our last, that ratepayers in large boroughs are entitled to as complete a control over the expenditure of public funds as ratepayers in small districts under Local Boards. A further important amendment is also to be moved by Mr. Craufurd—viz., the complete omission of clause 5, which gives authority to a Secretary of State to authorize the payment of now illegal expenses incurred within three years of the passing of this Bill.

Another material amendment to clause 3, to be moved by Mr. Holt, would give a twentieth of the ratepayers in a district, or any number of ratepayers representing one-twentieth of the rateable property, power to veto, at certain stages, further proceedings in promoting or opposing bills until the sanction of a majority of ratepayers is obtained.

Mr. Secretary Bruce evinces a laudable desire to save the rates as much as possible, by proposing a new clause which enacts that "the provisions of this Act shall not extend to applications for "any Bill in Parliament for any object which would for the time "time being be attainable by Provisional Order." And Mr. Delahunty seems to consider that it would be justice to Ireland to give Irish Local Boards the same facilities for wasting public funds that the English may enjoy, and he therefore proposes a clause to extend the Act to Ireland. The above are the most important amendments to the Bill, which, unless the Government persist in their resolution to have a November sitting, is hardly likely to pass into a law this session. Attempts at legislation of this kind, however, are certain to be repeated; and we cannot too strongly commend the provisions of this and all such Bills to the serious attention of ratepayers associations, which have so often acted as useful checks on the extravagance and folly of so-called governing bodies.

The fifth report of the commissioners appointed to inquire into the condition of the Exchequer (now Board of Trade) Standards has just been issued, and in it we find a further reference to gas-measuring standards. It appears that the question of the legalization of a standard test-meter has been raised in the metropolis, and has properly attracted the attention of the commissioners. Whether the use of such a meter be legal or not, it seems to be the practice in the City of London to test fixed meters with a 20-light test-meter, and stamp them as duly verified. The opinion of the warden of the standards is in favour of the legality of this proceeding. He believes there is authority for the use of a test-meter in section 6 of the Standards Act, 1866; and he further contends that the terms of section 3 of the Sales of Gas Act, 1859, which prescribes that the measuring standards shall be "gasholders measuring the cubic foot and such "multiples or decimal parts as the Treasury may deem expe-"dient," are fully complied with if "standard test-meters which "measure 5 cubic feet and 1 cubic foot respectively at one revo-"lution" are employed. Without entering upon any discussion of the point of law here raised, we may say that if the use of standard meters is not legal it should be made so at once. The cumbrous apparatus, certainly, indicated in the Sales of Gas Act is altogether inapplicable if the provisions of that Act are to be fully carried out throughout the country. Further than this, disputes are continually arising, to settle which it is advisable to test a meter in actual use *in situ;* and here again it is, in most cases, impossible to employ the standard gasholder of the inspectors. The majority of the commissioners do not seem to agree with the warden of the standards in his opinion as to the legality of test-meters, and they report as follows:—

> Under the head of standard measures of capacity the gas-measuring standards may be classed, being measures of gas or air or standards of volume. It has been shown to us that whilst the standard gas-measures of 5 and 10 cubic feet are sufficient for all comparisons of gas-meters brought be tested at the office of an inspector of gas-meters, a further provision is required both for the original verification and also subsequent reverification of large meters fixed on premises, and which cannot either be moved for verification to the inspector's office, or be verified *in situ* by the existing standards. For such cases, it appears to us both expedient and requisite that a standard test-meter, passing 5 cubic feet of gas or air, should be constructed and legalized as a standard, in order that copies may be duly verified for the use of local inspectors or verifiers.
>
> It has also been brought under our notice that the provision of the Sale of Gas Act, 1859, rendering it imperative, under penalties, that all gas-meters which are fixed in any place throughout the United Kingdom should be duly stamped by an inspector, comes into operation after the 10th of October, 1870, and that great facilities would be afforded for more effectually carrying out this provision, by enabling gas-meters so fixed to be verified by means of a more portable instrument than the existing gas-measuring standards, or the test-meters constructed to pass 5 cubic feet at one revolution. For such purpose, we are of opinion that a smaller test-meter to pass 1 cubic foot of gas or air should be constructed and legalized as a standard."

With these recommendations we entirely concur. If the Sales of Gas Act is to be made as generally applicable as the commissioners suppose it to be, but which is not the case at present, the provisions can only be effectually carried out by the adoption of test-meters. In the appendices to the report are a number of useful papers relating to the subject, and an interesting controversy as to the relative value of wet and dry meters, to which reference may be made on a future occasion.

The report of the Paris Gas Company for the past year possesses an interest which, happily, but seldom attaches to such documents. It records the trials and losses endured by the company during the siege. At the date of their previous report France was at peace, with little suspicion of a coming war, and certainly no thought that Paris would be subjected to the horrors of a siege and bombardment. The council of administration were therefore jubilant on the subject of past success, and confident in the hope of increased prosperity in the coming year. These hopes, however, were blasted by the outbreak of the war, and from the commencement of the Prussian investment of the city the manufacture of gas was gradually diminished, until early in December it ceased altogether, except to keep the pipes full, and to supply balloons, and some other exigencies of the public service. At the date of the investment the company had a larger supply of coal in store than usual, but still only sufficient for seven weeks normal consumption; great credit must, therefore, be given to the officials of the company for the skill with which they contrived to eke out this small quantity with a minimum of inconvenience to the public. In September the manufacture of gas was 16 per cent. less than in the same month of the previous year; in October it was 43 per cent. less, in November 63 per cent., and in December 95 per cent.

As regards the damage done to the several works in the course of the bombardment, we have some valuable details, which we must put on record here for the information of those who persist in believing in the danger of stores of gas. The governor of Paris entertained a notion of this sort, and thought the works at La Villette were dangerous to the fortifications in the vicinity. The company assured him that there was not the smallest risk. "If," they said, "a projectile made a hole in a "gasholder, and set fire to the gas, the gas would simply burn "out as a jet of flame. The constant pressure of the gasholder "would effectually prevent any access of air, and therefore there "could be no such thing as an explosion." This happened exactly at Ivry. A shell pierced the gasholder, and lighted the gas. There was a huge jet of fire for eight minutes, the holder slowly sank, and all was over. A more curious incident occurred at La Villette. There a shell penetrated a gasholder, *and burst in the interior without igniting the gas.* Nine fragments made their way out in different directions; but the servants of the company with great coolness and dexterity stopped the holes with plugs prepared for such an emergency, and so saved the greater part of the gas. At La Villette, also, a shell perforated the bell of a governor, and set fire to the gas; but there was no explosion. The fire was promptly extinguished, but the furniture in the office was destroyed by the explosion of the shell. At Vaugirard, where a great number of shells fell, only one penetrated a gasholder, and here again there was neither ignition nor explosion. These incidents, it is to be hoped, will set men's minds at rest for ever as to the supposed dangers of gasholders. The council, in their report, pay a well-merited tribute to the courage and coolness of their officers and servants, who steadily carried on the operations of the company, and protected the works in the midst of such dangers. The men, it appears, were formed into special battalions, officered by nominees of the company, and they did duty alternately on the ramparts and in the works. Married men were retained on full pay

all through the war, and the single had a liberal allowance. An ambulance, with thirty beds, was maintained at the expense of the company, and received 114 sick and wounded soldiers. Besides this the company contributed £1000 to the general fund for the wounded. Lastly, we may notice the gift of a ton and a half of lead towards the defence of the city.

The accounts of the company, as we receive them, are not yet complete; but we may mention that instead of an increase of revenue of £64,000, which was calculated upon, the company suffered a decrease of £301,920 as compared with the preceding year. Some of this decrease, it is remarked, might have been made up by raising the price of coke; but, seeing that this article is the fuel of the poorer classes in Paris, the company, with a liberality which cannot be too highly commended, declined to add to its price.

The amended Bill of the Alliance and Dublin Gas Consumers Company has gone to the House of Lords, with a petition from the Corporation of Dublin to pass it exactly as it left the Commons. The short-sightedness of the Corporation in refusing their consent to the amendment of certain errors made in the confusion of hastily remodelling the Bill in committee may justly be remarked upon, since the testing clause for illuminating power, as it now stands, must be completely inoperative, and will inevitably give rise to further disputes, which might well have been avoided. As it is, the quantity of gas to be consumed by the test-burner is not specified—an obvious mistake which could have been easily corrected.

The report of the European Gas Company, Limited, is, under the circumstances, eminently satisfactory, and the shareholders may be congratulated on receiving an 8 per cent. dividend. Considering that their principal stations, Amiens, Havre, and Rouen, were involved in the operations of war, it is a matter of surprise that the company should have done so well. In neither place, however, did actual fighting occur, and the works sustained no damage. The source of loss in each case was from the great diminution of consumption, consequent on the almost total cessation of business, and the strict regulations under which the towns were placed by the Germans.

Correspondence.

THE MANUFACTURE OF SULPHATE OF AMMONIA.

SIR,—Referring to your remarks in the last JOURNAL, on the paper I read at Dublin, "On the Manufacture of Sulphate of Ammonia," will you allow me to say that our apparatus cost about £200. I believe the depreciation to be about 2½ per cent. per annum.

Richmond Gas-Works, July 24, 1871. JAMES ELDRIDGE.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, JULY 17, 1871.

The HUDDERSFIELD IMPROVEMENT Bill was returned from the Commons, agreed to, with amendments; the said amendments considered, and agreed to.

TUESDAY, JULY 18.

The GAS AND WATER PROVISIONAL ORDERS CONFIRMATION Bill was returned from the Commons, with the amendments agreed to.

THURSDAY, JULY 20.

The TODMORDEN GAS Bill was returned from the Commons.

The NEWRY BOROUGH IMPROVEMENT AND WATER SUPPLY Bill was read a second time, and referred to a Committee, consisting of Lord Penrhyn (chairman), Duke of St. Albans, Earl Rosslyn, Lord Thurlow, and Lord Hatherton, who will sit on Monday, the 24th inst., at eleven o'clock.

FRIDAY, JULY 21.

The WATFORD GAS Bill was reported, with amendments.

The LIVERPOOL IMPROVEMENT AND WATER Bill was read a third time, with the amendments; further amendments made, Bill passed, and sent to the Commons.

The ALLIANCE AND DUBLIN CONSUMERS GAS Bill was read a second time, and committed.

MONDAY, JULY 24.

The following Bills received the Royal Assent:—The GAS AND WATER PROVISIONAL ORDERS CONFIRMATION; LINCOLN WATER; HUDDERSFIELD IMPROVEMENT; TODMORDEN GAS; and WATERFORD WATER.

The ALLIANCE AND DUBLIN CONSUMERS GAS Bill was reported, with amendments.

TUESDAY, JULY 25.

The BRIDGWATER WATER and the WATFORD GAS Bills were read a third time, with the amendments, passed, and sent to the Commons.

The NEWRY BOROUGH IMPROVEMENT AND WATER SUPPLY Bill was reported from the Select Committee, with amendments.

THURSDAY, JULY 27.

The ALLIANCE AND DUBLIN CONSUMERS GAS Bill was read a third time, with the amendments, passed, and sent to the Commons.

FRIDAY, JULY 28.

The LIVERPOOL IMPROVEMENT AND WATER Bill was returned from the Commons, with the amendments agreed to.

HOUSE OF COMMONS.

MONDAY, JULY 17, 1871.

A petition was presented against the MUNICIPAL CORPORATIONS (BOROUGH, &c., FUNDS) Bill, from the Bournemouth Gas and Water Company.

The GAS AND WATER PROVISIONAL ORDERS CONFIRMATION Bill.—The Lords amendments were agreed to.

TUESDAY, JULY 18.

A petition was presented against the MUNICIPAL CORPORATIONS (BOROUGH &c., FUNDS) Bill, from the Bristol Water-Works Company.

WEDNESDAY, JULY 19.

The TODMORDEN GAS Bill.—The amendments to which the Lords have disagreed not insisted upon.

A petition was presented against the MUNICIPAL CORPORATIONS (BOROUGH, &c., FUNDS) Bill, from Coventry.

THURSDAY, JULY 20.

The WATERFORD WATER Bill.—The Lords amendments to Commons amendments agreed to.

A petition was presented against the MUNICIPAL CORPORATIONS (BOROUGH, &c., FUNDS) Bill, from Ashton-under-Lyne.

FRIDAY, JULY 21.

Petitions were presented against the MUNICIPAL CORPORATIONS (BOROUGH, &c., FUNDS) Bill, from the Belper, Leicester, Liverpool, and Whitby Gas Companies, and from York.

TUESDAY, JULY 25.

The METROPOLIS WATER (No. 2) Bill was specially reported.

THURSDAY, JULY 27.

The LIVERPOOL IMPROVEMENT AND WATER Bill.—The Lords amendment agreed to.

FRIDAY, JULY 28.

MUNICIPAL CORPORATIONS (BOROUGH, &C.) FUNDS BILL.

On the motion for resuming committee on this bill,

Sir M. LOPES, in the absence of the honourable member for Leicestershire (Mr. Pell), moved that the House resolve itself into committee that day three months.

Mr. MELLOR seconded this amendment.

Sir H. SELWYN-IBBETSON moved the adjournment of the debate, and

Mr. DIMSDALE seconded the motion.

After discussion,

Mr. GOSCHEN suggested that the bill should be committed *pro formâ*, so that honourable members might have an opportunity of considering the questions they desired to bring forward.

Sir H. SELWYN-IBBETSON could not acceed to the suggestion of the right honourable gentleman.

The house divided—

For the adjournment of the debate	7
Against it	31
Majority against	—24

The CHAIRMAN, however, put the amendment that the bill be read that day three months.

An honourable MEMBER moved that the House be counted, and, as there were only 37 members present, the House stood adjourned at five minutes before three o'clock.

HOUSE OF COMMONS.

(*Before Viscount* BURY, *Chairman; Mr.* WATERHOUSE, *Colonel* STUART, *and Sir* JAMES STRONG.)

EDINBURGH AND DISTRICT WATER BILL.

MONDAY, APRIL 24.

Mr. CALVERT, Q.C., Mr. DENISON, Q.C., Mr. CLERK, Q.C., and Mr. POPE, Q.C., appeared for the promoters, the Edinburgh and District Water Trustees; Mr. RODWELL, Q.C., and Mr. SHIRESS WILL, on the petition of ratepayers and others in Edinburgh; Serjeant SARGOOD and Mr. MACDONALD for Mr. William Brown and others; Mr. MUNDELL, Q.C., for Mrs. Ann Scott, of Rodono; Mr. SHIRESS WILL appeared also for the Corporation and Police Commissioners of Selkirk and others—all in opposition to the preamble of the bill; the Duke of Buccleuch and Queensberry opposed on clauses only, and was represented by agents.

Mr. CALVERT, in opening the case for the promoters, said the case he had to bring before the committee was a bill to "Provide an additional supply of water for the city of Edinburgh, the town and port of Leith and town of Portobello, and district, and places adjacent, from St. Mary's Loch and Loch of the Lowes, in the counties of Selkirk and Peebles, and for other purposes." By an Act of 1869, the Edinburgh water supply was vested in certain trustees, who had found it necessary to provide an additional supply, and who had no interest whatever as to where the supply should come from, their sole object being to obtain a good supply. In 1868 the supply was in the hands of a company who had a most respectable residential agent—Mr. Ramsay—a man of great experience, and no doubt they did their best to furnish a supply; whether, however, the defect arose from a want of water brought into the town, or from imperfect distribution, there was no proper supply. Although the company were bound to give a constant supply, no constant supply was given. At length the three corporations of Edinburgh, Leith, and Portobello felt that the evil was so great that it was impossible to let that state of things go on any further, and they met to determine what was to be done on the subject. They applied to Mr. James Stewart, a civil engineer of very considerable eminence, living at Edinburgh, and they empowered him to take steps with two views. Mr. Stewart made an interim report upon the supply, the distribution, and the source from which a more adundant supply could be obtained. There were different reports published at various times. There was also a statement having regard to the North and South Esk, to the Heriot Water, and to the result of the examination of St. Mary's Loch. The trustees had carefully exercised their duty, and had been reasonable in coming to the conclusion that St. Mary's Loch was a proper source of supply. He believed that the South Esk supply had been by their lordship's committee attributed to Musselburgh, therefore that was for the present quite removed from all discussion. That was the statement Mr. Stewart made for the consideration of the committee. There was also a report from Mr. Sevenson Macadam, to the effect that the water was perfectly wholesome and of excellent quality for general domestic use. Then the joint committee come to the decision that the existing supply was deficient, "that a partial scheme would not obviate the necessity for obtaining at no distant date a totally independent and inexhaustible supply, and that the obtaining of a partial supply would be attended with expense which would only increase the amount which the three committees would have to pay for a complete scheme." After having come to that resolution they desired Mr. Stewart to make another examination, and report thereon. All the documents were circulated then amongst the town councillors, because these trustees had to make a report to the Town Council. A full discussion took place, and they then resolved and unanimously approved of the interim and supplementary report of the special committee, and recommended the whole subject to the special committee, to take such steps as they might consider proper to promote the requisite measures in Parliament, during the ensuing session; to elicit the opinion of the community on the scheme; and, on securing their approval, to negotiate with the water company, and other parties in-

terested, so as to avoid as far as possible opposition in Parliament. When the movement had assumed this shape, the water company thought proper to consider whether they could not supply an additional quantity of water, and they proposed to adopt what is called the Moorfoots scheme, which he believed had been introduced to this committee, for the purpose of supplying water to Musselburgh. The trustees under this bill, although acting in conjunction with the Town Council, are a different body, and were elected under the Act of 1869. A most minute examination was made of the Moorfoot's scheme proposed by the company, and a sub-committee appointed published a report thereon. Mr. Bateman and Mr. Stewart went into all the different schemes, and reported in favour of the St. Mary's Loch scheme. The majority of the Edinburgh Town Council were in favour of that scheme, but there was some difference of opinion amongst them. The engineers having given their decided opinion in favour of the St. Mary's Loch scheme, the corporation determined to promote it. That was in 1869. An amendment was moved in the Town Council, but twenty-four members voted for the motion, five for the amendment, and seven declined to vote. Technical objections were taken to the bill of 1869, as far as it related to St. Mary's Loch, as to the property of Lord Napier. The House of Commons disallowed the objection, but the House of Lords maintained the objection, and they said, "If you like, you may go on with the bill as far as it applies to the transfer of the works from the company to the corporation or trustees, but you must not go on with the bill as to the works of St. Mary's Loch. The consequence was, that in 1869 the matter came before Parliament, in a short bill to transfer the works from the company to the corporation, or trustees appointed by the corporation, and the works of St. Mary's Loch were entirely omitted. Clause 4 of that bill embodied the Water-Works Clauses Act. It also added this provision: "Provided always that the trustees shall not be bound to have the water constantly laid on under pressure, and that no penalty under the said incorporated Acts, in respect of supply, shall attach to the trustees for a period of five years from the vesting of the undertaking in the trustees under this Act." The effect of that was, that if the Act had been passed simply embodying the Water-Works Act, the trustees, immediately they took possession of the water-works, would have been bound to maintain a constant supply. Practically, that would have been impossible. The House of Lords, therefore, modified that obligation, and said that it should not arise until five years after they had taken possession of the trust. The 15th of May, 1870, was the day they took possession of the works, and the consequence was, that before the 15th of May, 1875, they must put themselves in a position to maintain a constant supply. It was very necessary for the trustees to be extremely active to get an additional supply of water as soon as they came into possession of the works.

The CHAIRMAN: Where did the trustees, under the Act of 1869, draw their water from?

Mr. CALVERT said the trustees were to get the water how they could; they were to buy the water company's supply, but, having bought it, they knew that that supply would not enable them to give constant pressure.

The CHAIRMAN: Where does the water for Edinburgh come from?

Mr. CALVERT said he was told it was obtained from the places marked green on the maps. He understood it came from the neighbourhood of the Pentland Hills. The learned counsel then proceeded to read the preamble of the bill. In clause 6 there is an amendment in the constitution of the trustees. The evil was, that all those trustees might possibly go out of office in the month of November, and there might be a body of quite new trustees, and a want of knowledge as to the management of things would have been a serious evil to the community. Under those circumstances they merely adopted the usual rotation, by which one-third went out of office every year, there always being two-thirds of the old members left, which would prevent the evils arising from ignorance on the part of the new trustees. Clause 9 contains a statement of the work to be executed. In clause 11 there is a limit as to the extent to which the levels of the lochs may be raised and lowered. The maximum of water to be taken into Edinburgh is 24 million gallons. The quantity of water which is to go as compensation down the river Yarrow into the Tweed, is to be 15 million gallons per day. By clause 15, that water is not to be taken for the city, unless at the same time the water compensation is poured down the river. Clause 21 limits the power of purchasing land to five years, and seven years, by clause 22, for completing the works. Clause 27 points out the limits of supply, which are the limits of the other Act. (He was informed that the time for taking the works, which in clause 21 of the print is called five years, had been reduced to three years.) Clause 33 limits the domestic water-rate. It cannot be more than 3d. in the pound, and the houses or premises cannot be assessed at more than £150. The public water-rate is not to exceed 1d. in the pound. Clause 40 limits the powers of borrowing money. The corporation, anticipating that the bill must be passed, were very anxious that no time should be lost. A remit to the committee was made to the effect to adopt means to ascertain the unnecessary waste of water, and how the present supply could be most equitably distributed; also to take steps to ascertain when an additional supply would be obtained, with power to seek such professional assistance as might be necessary, and that no bill should be lodged in Parliament until a full report of the results of the foregoing inquiries had been submitted. So anxious were they that no time should be lost when the bill which they anticipated should be passed, that as early as November, 1869, they took most active steps to obtain proper information on the subject. The committee made their examination upon all the different matters, and in doing so they were accompanied by the engineers; and he would have to call their attention to one or two passages in some of their reports. In the report of Mr. Leslie, a distinguished civil engineer, it is stated that the quantity of water supplied to Edinburgh is 683 cubic feet per minute. That was an average of four months—June to September, 1869. The report went on, "That is, in round numbers, 6 million gallons per day. It is equal to 27 gallons per head per day to a population of 216,000, and if 14 per cent. be deducted, as the estimated supply to manufacturers, 24 gallons per head per day are left for domestic consumption. If 33 per cent. of this be wasted, then only 15½ gallons per head are available for domestic supply." There was a statement in the same report as to the supply of water obtainable from St. Mary's Loch. The same report also stated "the trustees are of opinion, after examining the water in the loch, as well as that flowing into it, that the quality of the water is in every respect highly suitable for town supply." They were also agreed, looking to the immense area and purely pastoral character of the drainage ground, and the large size of the loch itself, that it offered a practically inexhaustible source of supply; while, as pointed out by Mr. Bateman, in his report of Feb. 4, 1867, "the natural beach which the loch possesses will preserve the water from all injury and discoloration which would attend it if stored in large artificial reservoirs, with clay or gravelly slopes, rising or falling according to the state of the weather, and exposing fresh surfaces for abrasion by the action of the wind. While arriving unanimously at the conclusion above expressed, considerable differences of opinion are entertained by the trustees as to the engineering difficulties and consequent expense of the St. Mary Loch scheme. Upon that branch of the inquiry, however, it is not proposed to enter." They also reported with regard to the south side of the Pentland and the Tweed. They reported also on the South Esk and Heriot schemes, all near Edinburgh. Mr. Gale, the resident engineer of the Glasgow Water-Works, was also consulted, and he reported in favour of the St. Mary Loch scheme in preference to the Tweed. The whole district was examined, and on the 15th of May the trustees commenced their further inquiry into the amount of water and the system of distribution. It might be laid down that 250,000 persons were to be supplied. The effect of the dry season last year was to impoverish the supply of Edinburgh to a frightful extent. Under the advice of Mr. Crum Brown, a great water authority, Dr. Frankland was instructed to visit all the proposed sources of supply, and as it was found there was a difference between Mr. Stewart and Mr. Leslie as to the expense to be incurred in St. Mary's Loch, it was necessary to call in another engineer, Mr. Bateman. Mr. Stewart said that, excluding the agricultural ground, the expense would be £43,000 per million gallons; Mr. Bateman said, including the whole of the agricultural drainage ground, it would be £30,000 odd; Mr. Stewart said it would be £35,764, and Mr. Leslie said it would be £26,000. All the information that had been obtained was laid before the public, and in November, 1870, the election took place for the municipality and for the trustees. If there was any cause for distrusting the course which the trustees were taking, then was the time at which the electors would have changed the trust. On the contrary, they elected exactly the same trustees, or rather they made no change of the smallest possible importance, and that was a very strong indication of the feeling which prevailed in Edinburgh as to the propriety of the conduct and the course they were pursuing. In consequence of the publication of an anonymous letter, signed "Physician," containing statements derogatory to the scheme, the trustees made a further inquiry, and they employed Dr. Frankland, Mr. Wood, Dr. Littlejohn, and Dr. Stevenson Macadam to see whether any mistake had existed or not. Those gentlemen reported entirely in favour of the St Mary's Loch scheme. He need hardly say that the effect of the anonymous publication, which bore rather a scientific character, was to create doubt and distrust amongst the people of Edinburgh; and he believed for that reason the committee had before them a petition, signed by a great number of persons, against this bill. With regard to the expense, the trustees believed that Mr. Bateman and Mr. Stewart were right in their calculations, but they thought Mr. Leslie had made a mistake. Under those circumstances, they desired Mr. Stewart to prepare all the papers, with a view to legislation this session; and on Mr. Bateman's return from abroad, he had carefully considered the scheme. Mr. Bateman was then appointed consulting engineer. It would be seen that they went to the very head of the profession to satisfy themselves. Copies of the bill were circulated, and it was approved by the Town Council of Leith and Portobello. In the Town Council of Edinburgh there was a very considerable difference of opinion. There were statements as to the unwholesomeness of the water and the price, which were all, however, inconsistent with the real state of the case. No end of different publications were put before the public. There was a numerously signed petition against the bill, and it was to be feared the enthusiasm of the opposers had carried them beyond the bounds of decorum in obtaining signatures to it. He admitted there was a strong feeling among a certain number of the people on the subject, which had arisen since the end of 1868. Why? Because all sorts of false statements had been published. All the matters which had alarmed the inhabitants of Edinburgh would be cleared up distinctly before his lordship. The question was really simple enough. The possibility of the present supply to give a constant service was admitted on all hands to be out of the question, and that it could not be got from Heriot nor from Moorfoot was now plainer than ever. It could not be got from the Pentlands, and the only other places were the Tweed and the St. Mary's Loch, the Tweed system being to the westward of St. Mary's Loch. As to those two the matter had been thoroughly investigated, and he thought the committee would be of opinion that he had made out his case satisfactorily. The ratepayers in their petition stated that the promoters had not given access to all the information and documents in their possession. The promoters had given access to every information that could be favourable to Edinburgh; but as to people outside Edinburgh, they did not wish to publish everything for them. However, there was no concealment of any sort or kind from the committee now, and he thought that allegation was by no means carried out by the facts which had taken place. With regard to Mrs. Scott's petition, she complained, practically, that this would damage her property as a matter of amenity. The petitioners would be sorry to do any harm to her property. There was a road between her house and the loch, and between the road and the loch there was a great quantity of marshy ground, and care had been taken to ascertain what would be the consequence, in the event of the utmost evil she expected, which was the reduction of the level of the water to a considerable extent. The water fell very precipitously, and the consequence was that her amenity would be slightly affected. Matters of this kind were subjects for compensation. Lord Napier, Lord Wemyss, and the Duke of Buccleuch, were quite satisfied with the arrangements made by the promoters. The petitions of the Corporation and Police Commissioner of Selkirk, and Mr. Brown, represented the millowning and landowning interest on the banks of the Tweed and Jarrow, and instead of doing them damage, the promoters were going to do them a very great good. They were going to let them have the water just as they wanted it, and they would have more than ever they had before. He believed he had now stated all that was necessary upon the subject. His sole object had been to let the committee see what had taken place; that, from the first, great anxiety had been felt on the part of those on whose behalf he was asking, to find out the best supply. They had no preference for any particular district. They employed persons of the highest eminence and scientific knowledge, and they said this, "Go and find us the best supply in Edinburgh. We want pure water, we want a sufficient quantity, and we want it upon as economical terms as it can possibly be had." The numerous reports of the scientific gentlemen only proved the diligence and impartiality with which the investigation had been going on from 1868 down to the present time. He hoped the committee would be of opinion, when they had heard this case, that there could be no doubt that St. Mary's Loch was the proper place, and that the plan by which the promoters proposed to supply Edinburgh with water was the proper one. The committee would find that while on the one hand they would be able to take as much as 4 million gallons a day to supply Edinburgh, Leith, and Portobello, there would be 15 million gallons sent down the Jarrow and the Tweed. Therefore, on the one hand, Edinburgh would have a plentiful supply of water; and on the other hand, the millowners on the Jarrow would have no ground to complain. The committee would, above all, observe the excessive activity which had taken place for the purpose of leading the good people of Edinburgh to a wrong conclusion. He thought he would show their lordships why it was that, whereas only seven members of the council in 1868 doubted the propriety of the St. Mary's Loch scheme, after the "Physician" had been at work, and after the various publications had been issued, that there came a much larger division in the Town Council. He thought it would be found that mere delusions had been palmed upon the people of Edinburgh, and he trusted they would pass the bill.

Mr. *David Lewis*, examined by Mr. POPE.

I am a member of the Town Council of Edinburgh, and a magistrate of the city. I have given considerable attention to the water supply for the last seven or eight years. In the ward I represent, the water question is felt to be of vital interest. In consequence of my constituents having urged upon me the necessity of endeavouring to improve matters, I was sent, as one of three representatives of the Town Council, to the Board of Directors of the Water Company, in 1866. I was re-elected yearly during the company's existence, until it was transferred by the Act of 1869 to the trustees. There was a great struggle on the part of the public to obtain a change in the character of the water supply. The supply of the old company was by no means adequate. There were constant complaints as to a deficiency in the amount of the supply, and in every respect as to its inadequacy. Under the water company's Acts, the company were bound to keep up a constant supply, to keep the pipes under constant service day and night, so that the water would be found in the highest flat of the highest house of the city during the entire year; but in innumerable instances this was not, and, I believe, could not be the case, in

consequence of the limited supply at the command of the company. I got very peremptory instructions from the Town Council, in 1867, to endeavour to get at the real cause of the deficiency at whatever cost and labour might be expended, and we found, by personal visitation, and by the employment of practical men, that in the higher flats of the tenements there was no water to be found very early in the season. As the drought increased, the supply ceased to be found in the lower flats, and as that continued to increase, we found it disappearing from the ground flats. To such an extent did the deficiency increase in that year, that latterly it disappeared from the mains, and when the corporation inspector was drawing water to water the streets it was found that the main-pipes were empty. I then felt it my duty to move in the Town Council for the appointment of a special committee to inquire officially into the cause of the existing deficiency. The motion was seconded, and 24 voted in its support, and 4 against it. That was on the 23rd of June, 1868. In Edinburgh, the tenements, more especially for the working people, are very peculiarly constructed. We have floors ranging above floors to the height of six and eight, and in some places ten different tenements, and upon each of those floors it is no uncommon thing to find as many as ten and twelve, and sometimes more, families. We were able to trace the consumption of the storeage which had taken place during the wet season, and it afforded an irresistible illustration of the want of pressure in consequence of the want of supply. Shortly after the adoption of the resolution of June—very early in July—an invitation was forwarded to the representatives of Leith and Portobello. They responded, being in similar difficulties with us, and entered very readily into the resolution to co-operate, with the view of seeking a better supply for the entire district. I immediately obtained scientific advice. At our first co-operative meeting we resolved to appoint Mr. James Stewart, C.E., to investigate the matter, and report upon the whole question, and to ascertain whether a sufficient supply of pure and wholesome water could be obtained. Mr. Stewart was given distinctly to understand that he was free and unfettered in regard to the nature of his remit. None of us had any foregone conclusions as to where we were to look for a supply. At the first meeting I was appointed convener (or chairman) of the committee. On the 28th of August Mr. Stewart reported to the effect that he had visited the North and South Esk and the Heriot district, and that, all things considered, he found the St. Mary's Loch was the preferable one. It was accompanied by a certificate from Dr. Macadam as to the excellent and wholesome character of the water. Upon this report we made a resolution that Mr. Stewart should have the remit again sent back with instructions to go into the matter somewhat particularly, and give us an estimate of the cost of the scheme which he proposed. Mr. Stewart was warned that it would be extremely undesirable to consider any estimate which might involve a partial supply. Mr. Stewart presented a supplemental report on the 6th of October, 1868, in which he estimated the cost at £380,000, exclusive of land and contingencies. On the 14th of October the special committee employed another engineer (Mr. Bateman) to examine Mr. Stewart's plans and estimates. Mr. Bateman pronounced the scheme recommended as extremely simple, and that the plans met his approval. Upon this opinion a report, dated October 24, was presented to the Town Council, recommending them to authorize an application to Parliament for the St. Mary's Loch scheme. On the 5th of November the council unanimously resolved to re-commit the whole matter to the special committee to take what steps they thought proper to promote the measure in Parliament. There was unanimity of action between the three corporations. The clerk was accordingly instructed to have the bill drafted and lodged and the statutory notices prepared. Our municipal elections were postponed, in consequence of the Reform Bill, for one month, so that we had an opportunity, between the 5th of November and elections in December, of having the whole matter laid before the meetings of the electors in their various wards. I am not aware there was any indication on the part of the various constituencies of disapproval of the action of the Town Council. In my own ward there was a feeling of general thankfulness. In January Mr. Bateman was requested to come down and personally visit the South Esk, Heriot, and St. Mary's Loch districts. In the meantime, we discussed the question, which led to the suggestion of other districts being looked at. The water company by this time feeling that there was a prospect of something definite being done, bestirred themselves with the view of staving off this bill, and proposed the Moorfoots scheme. Mr. Bateman, after personal inspection, recommended the St. Mary's Loch scheme as being the only one calculated to meet the necessities of the case. The special commission were then perfectly satisfied, and they resolved to take immediate action, and to have a bill brought before Parliament at the earliest possible stage. Mr. Stewart had also made further investigations. On the 18th of February, I, moved a resolution to the effect that the Town Council should promote a bill for the taking over the company's undertaking, either by agreement or arbitration, and for obtaining an additional supply of water from St. Mary's Loch under the scheme recommended by Messrs. Stewart and Bateman. A number of amendments were proposed; 24 members were in favour of the motion, 5 were against, and 7 were neutral. In order to ascertain the opinion of the inhabitants, four large district meetings were held in various parts of the city, at which the whole scheme was read. Energetic measures were adopted to secure publicity. The meetings were all largely attended, and the whole four pronounced decidedly in favour of the scheme. In order to avoid an unnecessary expense we communicated with the water company, stating our willingness to appoint a deputation to hold a conference with them, and, if possible, to come to an amicable settlement without a parliamentary contest. Our bill of 1869 passed the Standing Orders of the House of Commons, but in the House of Lords a technical objection was raised, affecting the interests of Lord Napier, and the bill was arrested; but in consequence of the extended necessity for water and the alleged, at least, maladministration of the water company, we were allowed to proceed with the Act in so far as regarded the transfer of the works. The St. Mary's Loch part was struck out, and we fought out our bill on the transfer basis. There was ultimately a compromise between ourselves and the water company. We came to an agreement, and the matter resolved itself into the Act of 1869. There was a variance between the plans and the sections, which the examiner held to be a fatal objection unless allowed to be amended, and the bill never got further than Standing Orders, therefore the attention of a parliamentary committee has never been directed to the merits or demerits of the St. Mary's Loch scheme. The Act of 1869 vested the undertaking of the company in the trustees. By that Act the Water-Works Clauses Act is incorporated with the undertaking of the trustees. The House of Commons committee were so satisfied that the trustees would be entirely incapable of complying with its provisions in consequence of the deficiency of supply, that they refused to insert the penalty clause. It would have rendered the trustees liable to a constant service, and the House of Commons postponed its operations for five years by the proviso. It was, in point of fact, giving the trustees five years in which to construct or to obtain power to construct works to enable themselves to comply with the water-works clauses. In the House of Lords, notwithstanding opposition, the five years was adhered to. So soon as we got back with our Act of Parliament, the opposition then raised the difficulty that, before we applied to Parliament for an additional supply, it would be expedient that, having the prospect of the works in our own hands, we should endeavour to stay proceedings for one year, and ascertain whether we could by the checking of waste and by economy, and a more careful distribution, get along with the supply that we had from the water company. That idea was caught up to a considerable extent, and the trustees, in order to avoid continued opposition, resolved to do everything they could to demonstrate that the object was not to be attained. During the parliamentary contest, it was repeatedly alleged that we were a population of 216,000, receiving 40 gallons per head per day, which would have been sufficient. On the non-existence of the company, we applied to Mr. Leslie, who informed us that, taking June, July, August, and September, 1869, instead of 40 gallons per head, we had only 27 gallons. That included manufacturing works, and was, in fact, the entire supply. In evidence, the manager of the company said that 14 per cent. was deducted for manufacturing purposes, and then there was an alleged waste, which would make it up to 33 per cent., and would reduce the supply to something like 15½ gallons per head, available for domestic purposes.

By the COMMITTEE: Glasgow has 50 gallons per head to the entire population, and I do not think Edinburgh is safe, as a city, with less. Many of our builders during the last twelve months have had to suspend operations for want of water.

The CHAIRMAN stated that the committee had been told, in the Musselburgh and Dalkeith Bill, that 20 gallons a head was the proper amount.

Mr. POPE said that a different quantity would be proved to be necessary in the present case.

Examination resumed: In that year 13·5 was the minimum supply. That would not leave, deducting manufacture and waste, 10 gallons a head. That is based upon the assumption of a population of 216,000, but by the present census it is about 250,000. From my experience of last summer, that would work out an average per head of something like eight or nine gallons for domestic consumption. We have five reservoirs, and I visited them more than once in the summer, and found them literally empty—not one available drop to supply our wants. This scarcity is not felt equally by all classes in Edinburgh, and that is one of our misfortunes, and it is one of the reasons we think it so essential to have constant service. Our water apparatus has been all fitted up under those statutes making permanent supply indispensable—that is, they come under the statutory penalty if there is water lacking in any house during any day in the year. Under these arrangements, the water apparatus has been fitted up with very small cisterns in the houses of the workpeople, because of the supposed constant pressure in the pipes. Under constant pressure the size of the cistern would be immaterial, but with these small cisterns supplying one family (and in some houses there are half a dozen), when there is not an intermittent supply the cistern is not filled; but in the houses in the new town the cisterns are of immense capacity; in some, four or five cisterns have been constructed to take a supply during the hours the supply is on; so that you may have in a house 500 gallons, or as many thousand gallons; whereas, in the houses of the workpeople, you only fill a small cistern, and the water goes off, and they have no more for the next 24 hours. Hence we find that in many high-rented houses the deficiency has been felt to a very limited extent. In my judgment, it is most essential that provision should be made immediately for constant service in the localities inhabited by the poorer classes. On the 3rd of August the Town Council elected the board of trustees. The first meeting of the Water Trust was held on the 2nd of September, and they resolved to remit to the Works Committee to adopt measures to ascertain the extent of the unnecessary and preventable waste of water, and how far the present system could be equitably and advantageously distributed, and also to take steps to ascertain where an additional supply might be obtained. By this time we had received three proposals, and the Works Committee visited each of the localities with the respective engineers who had taken an interest in these three proposals. They were the Heriot, Moorfoot, and St. Mary's Loch. On the 20th of October, 1869, the committee presented to the Water Trustees an interim report, signed by myself, treating of some general considerations affecting the selection of sources of water supply, and the matter was left entirely open to the trustees to deal with any scheme which they might consider the best. The trustees for the year 1869 to 1870 were elected in Nov., 1869. At the October meeting a detailed statement of the amount of the expenses which had been incurred in passing the bill was submitted. All our statements and reports had been published before November in the Edinburgh newspapers. At the election there was no material change in the *personnel* of the trust. On the 23rd of November the matter was again before the trust. The Works Committee were instructed to ascertain, by means of rain-gauges, the rainfall of the various districts under discussion. On the 26th they appointed Mr. Gale, of Glasgow, as their consulting engineer. He, in conjunction with Mr. Buchan, regularly submitted reports to the trustees, which appeared in the newspapers. We had an important meeting of the trustees on the 28th of January, 1870, at which all the reports as to the scheme and the rainfall and other matters were received and made public. On the 16th of May and the 25th of June Mr. Gale reported, both reports being presented on the 12th of July to a meeting of the trustees. This was the summer in which the water was so scarce. On the 10th of August the question of the scarcity came before the trustees. We felt so hardly pressed from various quarters that we resolved to open wells in the city that had been closed for many years. In connexion with the Police Commissioner, and at considerable expense, this was done; but the water was found in many cases to be so impregnated with sewage that the medical officer prohibited its use. The trustees then determined to proceed with their parliamentary application. Mr. Stewart was appointed resident, and Mr. Leslie consulting engineer. The sub-committee again visited the Talla and St. Mary's Loch district, and Dr. Frankland was called in to analyze the various waters and report. On the 19th of September Mr. Stewart's report was brought before the committee, and remitted to Mr. Leslie. On the 7th of October, Mr. Stewart's report having been submitted to Mr. Leslie, there was an interim report from Mr. Leslie. Some difference was found between the two engineers reports as to their estimates, in consequence of which several committee meetings were held. The committee thought it desirable to consult Mr. Bateman, and the latter gentleman presented a report of the results of his investigation. We have relied upon the reports of Mr. Bateman and Mr. Stewart as witnesses to support our scheme. Some years ago I lived upwards of a month on the confines of St. Mary's Loch, and had an opportunity of experimenting upon the quality of the water. It is not a populous district. The water is used by the inhabitants. I visited the loch again last winter, and I am satisfied there are hundreds of very strong springs to be found in it. The opposition to the scheme was not prominent until after the re-election of the trustees and the lodgment of the bill, and the whole discussion, as it was apprehended by the community, had finally terminated. The opposition has been very important in its character. Most of the objections have been suggested by anonymous letters. Advertisements have been published by the opposition that the rates would be doubled, if not trebled, by the passing of this bill. There is no truth in that allegation; 8d. is the present water-rate. The domestic rate is unlimited under the bill; the maximum is 3d., and the sanitary rate is 1d.

TUESDAY, APRIL 25.

Mr. *David Lewis* recalled, and examined by Mr. POPE.

Among the statements publicly circulated is one to the effect that the expenditure under the bill of 1869 has been purposely withheld from the public attention in order to stifle opposition to this scheme. The fact is, that in October there was a full detailed statement of the entire expenses laid before the Water Trustees, which was published in detail in the newspapers next day, for the information of the public. It has also been alleged by our opponents that we have not taken proper means to test the value of our existing supply, and to prevent waste. That is not the truth. The first step taken was to ascertain if the alleged waste existed, and to what extent, and we were met at the very outset with the difficulty that the pipes were not under constant pressure by reason of an intermittent supply, and we were unable satisfactorily to ascertain whether or not there was a defect in those pipes. We applied to

Mr. Gale, and he reported that nothing could be done that would naturally affect our case by dealing with the apparatus under an intermittent supply; but, notwithstanding that, we were so anxious to satisfy the complaints, that we appointed four inspectors, who visited upwards of 30,000 families, and issued between seven and eight thousand notices, calling attention to the defects in the pipes, which existed very generally to a limited extent. Under our existing Act, the assessment upon the houses of the poorer people—that is under £5 rental—is 4s. per annum for water, and the present bill contemplates increasing the assessment 1s.—that is to 5s.—upon all rents under £5. I know the Heriot district. That district supplies, and to a large extent constitutes, the Gala, which is the river that runs down through the centre of Galashiels, one of the largest manufacturing towns in the south of Scotland. Having resided at Galashiels for some years, my opinion is that the difficulties would be insurmountable in dealing with the Heriot supply when brought into contact with the manufactories of that town. The water supply at Galashiels itself is very bad. The South Esk part of the Moorfoots has now been given by the House of Commons to Musselburgh and Dalkeith for their supply. That being the case, there appears no alternative for Edinburgh but St. Mary's Loch or the head of the Tweed. As regards the head of the Tweed or Talla scheme, it has received anxious consideration, and, on the whole, the St. Mary's Loch scheme has been preferred.

Cross-examined by Mr. WILL: We are not unanimous in the Town Council on the subject. According to the last minutes there were 21 in favour of the scheme, and 19 against. That was upon a motion made for the disapproval of the minutes, when there was a resolution of the Town Council to go in for the scheme. A meeting of the opponents of the scheme has been held; it was attended by a large body of very respectable citizens, being held at two o'clock in the afternoon, and, of course, none of what we call the working class could expect to be present. There has been no meeting in favour of the bill in its present form, or any petition in its favour. I think we could have got, instead of 14,000 signatures—had it been deemed expedient—a petition in favour of it signed by 40,000.

By the COMMITTEE: Twenty-three of the 25 Water Trustees are members of the amalgamated Town Councils of Edinburgh, Leith, and Portobello.

By Mr. WILL: Seventeen are elected by Edinburgh, five by Leith, and two by Portobello.

By the COMMITTEE: I think the majority of 22 in favour of the scheme comprised 14 of the Edinburgh Town Councillors who were members of the Water Trust.

By Mr. WILL: Evidence was given in 1869 that the supply of water to Edinburgh was 40 gallons per head per day subject to waste; but it was not conceded by the witnesses promoting the bill. I should think at that time it was conceded to be from 27 to 30 or 32 gallons—I am speaking of the average supply of the year. Taking the minimum supply for June to September, 1869, it would only be 27 gallons per head. The 1869 inquiry turned a great deal upon the question of waste, and Mr. Hawksley endeavoured to demonstrate the possibility of checking waste in such towns as Norwich.

Mr. WILL: By the time that the bill got to the House of Lords, is it not a fact that the promoters themselves and you yourself were in doubt whether it would be necessary to come to Parliament for a further supply, or whether it would not be sufficient to have a more effective system of distribution?

Witness: Personally I never entertained any such idea for a moment.

Mr. WILL: Was not that the case opened to Parliament?

Witness: Yes; but in the view of the inquiries and investigations made by the special committee the representatives of the corporation were perfectly satisfied, before coming here, that an increased supply of water was indispensable. I do not think it was a matter of doubt with any member of the special committee. The five years clause in the bill of 1869 was not to enable us to render the distribution more effectual, so as to prevent waste. I do not think the question of distribution was ever entertained by the corporation until they had been some weeks, if not months, in Edinburgh, where the same parties who had been opposing the bill brought the question very prominently before the public, and, consequently, before the representatives of the corporation.

Mr. WILL: Do you mean to say that the prevention of waste was not distinctly contemplated as part of the duties which you were to undertake when you got the bill of 1869?

Witness: Of course, that being one of the general duties of all Water Trustees, to diminish the least waste wherever found.

Mr. WILLS: To limit the exceptional waste said to exist in Edinburgh of 33 per cent?

Witness: The committee never have admitted, for they had no means of knowing whether there was a waste to the extent that was alleged or not.

Mr. WILLS: You heard that there was a waste of 33 per cent., and I ask you now, because I shall call evidence upon the subject, whether it was not distinctly contemplated that this should be one of the first duties that you were to undertake if you got the Act of 1869?

Witness: Most certainly it was.

Mr. WILL: And it was also a fact, was it not, that according to the evidence that was adduced before the committee, if that waste was properly prevented, the supply of available water to Edinburgh would be sufficient for the purposes of the town?

Witness: I do not think that idea was entertained by any of the promoters of the bill, because, before any action had been taken in support of the bill, they were unanimously of opinion that an additional and largely-increased supply of water was an indispensable necessity. We directed the attention of our engineer, Mr. Stewart, to the waste, who at once suggested the difficulty that he had in giving effect to the remit in consequence of the pipe not being constantly charged with water, and in the absence of that pressure it was impossible to ascertain whether we had defective leaking apparatus or not. He did not report in writing. As a director of the company, in whose hands the water supply was up to May, 1870, I suggested the employment of an engineer to examine the various measuring apparatus, in order to ascertain really what was the quantity of water supplied by the then existing works. The directors, however, refused to take any action as long as the water-works were in their possession. Mr. Gale's report of the 16th of May, 1870, the day after the trustees got possession of the works, stated that nothing that could be done to lessen the waste would affect very much the quantity wanted by the town for the ensuing summer. I cannot say positively whether there is any report in which we deal with the prevention of waste; but the inspectors have been unremitting in their duties up to the present time in checking the waste that is discoverable.

By the COMMITTEE: I cannot say whether the inspectors have reported.

By Mr. WILL: The reports published are those of Mr. Leslie and Mr. Stewart. The reports, so far as the cost of the scheme is concerned, have all been published. There are reports by Messrs. Bateman, Stewart, and Leslie, which we have refused to allow the ratepayers to see, under the advice of the solicitor charged with the prosecution of the bill.

Mr. WILL stated that he must now call for the production of the reports of Mr. Leslie and Mr. Stewart.

Mr. POPE said that his learned friend was not entitled to the reports, and he should decline to produce them.

After some discussion,

The CHAIRMAN suggested to Mr. Pope, in order to save time, whether it would not be advisable to produce the reports, although he did not feel called upon to insist upon their production.

Mr. POPE said the promoters would, by to-morrow morning, determine the course they would pursue, but he would distinctly pledge himself to call Mr. Leslie.

By Mr. WILL: I cannot say directly if we have at present an available quantity of water equal to 7 million gallons a day for distribution. I am not presumed to know until we have the report submitted, which has not been for the last month or so.

Mr. WILL: Are you, then, promoting this bill without knowing what is the present available amount of water for distribution?

Witness: I do not think that the present amount of water supply at all affects my position as a promoter of this bill. I am here, after seven years experience, and I have stated, as I now state, that the difficulties are continually increasing. It is not more difficult to supply water to a flat than to a house, if you have constant pressure; but if you have pressure that will only send water into a cistern one story high; you can never, by any possibility, get it from three to four, and eight and ten stories high. We propose to take 24 million gallons from St. Mary's Loch. At present, we propose to bring in 12 million gallons as a first instalment. I cannot say if that will be 96 gallons a head per day. I am certain that by taking that quantity we shall not be depriving the people of Selkirk of their supply of water for domestic purposes. I know the mill lade at Selkirk. There are various mills of the corporation on it. I have ascertained that our design would not affect these mills. We take powers in this bill to sell our existing works. We also take power to supply other local authorities outside Edinburgh, with whom we may contract. I am not aware how much of the 24 million gallons we propose to supply to these latter parties. That view of the case has not been under consideration, as far as I am aware.

By the CHAIRMAN: It is within the range of possibility that we may be asked to supply Galashiels with Selkirk water from St. Mary's Loch.

The CHAIRMAN: I should like to know whether, under the 38th clause of the bill, it was contemplated to supply Musselburgh and Dalkeith at any time with water, or whether the power to contract with local authorities had any reference in the mind of the authorities of Edinburgh to Musselburgh and Dalkeith?

Witness: I believe that it was regarded as a possible thing. There was no official formal negotiation entered upon, but I cannot speak positively about it; however, it appears to me there was some recommendation in the Duke of Richmond's report as to water supply that led to the insertion of that clause. I am alluding to the Royal Commission, and I think that that report proceeded upon a recognition of the principle that where large cities required to go for a supply of water, it was but right and fair that they should consider the reasonableness of supplying intervening towns that might naturally be supplied from the same source.

By Mr. WILL: I am not aware that the same report also laid down the principle that no town should be allowed to go out of its own geological district for its supply if water could be obtainable therein. I think that principle a reasonable one. I think it has been complained that the proposed water was too soft for domestic purposes. It may be regarded as soft, but not objectionable. The objections raised by "A Physician" were of a different kind. I was at the loch last winter, and I found that after six weeks frost there were springs in hundreds where the ice was from 6 to 10 inches thick, which had resisted the action of the frost during that period. There were no cracks in the ice. I believe there are water-fleas there, as in all impounded waters. I have not seen any fleas there; but I have seen them taken from our existing reservoir. There was also a complaint that the water was full of decomposed animal or organic matter; but I am not certain of the accuracy of that statement. The Water Committee's report having reference to the fleas was furnished to all the papers, and was published fully in the *Daily Review*.

Cross-examined by Serjeant SARGOOD: I should like to see 50 gallons per head supplied to Edinburgh.

Serjeant SARGOOD: Allowing a population of 250,000, and your 50 gallons per head per day, that would bring out a figure of 12,500,000 gallons a day. As you are proposing to take 24 million gallons, I want to know whether that extra 11½ millions beyond the 50 gallons a day is in order to enable you to give extraneous supplies to other people out of your district?

Witness: It is proposed to limit the quantity of water brought in at present to 12 million gallons, taking care to construct the tunnels and conduits of such dimensions as would on a future occasion admit of the introduction of a second pipe to convey the other 12 million gallons. My impression is, speaking roughly, that assuming we were five years before we had these works completed, it might be something like about 20 or 25 years before we would require to introduce the second instalment. Whenever the necessity arises, of course, the 12 million gallons will have to be increased. Compensation is an important question to millowners. Under our present limited arrangements we are still under heavy penalties to compensate millowners. We had this summer to turn one of our best streams into the bed of the river, while the people were famishing in consequence of the arrangement. It is but reasonable that there should be penalties in the present case.

Serjeant SARGOOD: I am not induced to quarrel with your calculations, but, looking at the report of your friend Mr. Gale, I find that in pamphlet 7, calculating on a table the increase of population, he says, "At the same rate of increase, the quantity of water required, in addition to the present supply, will be, 100 years hence, 20 millions of gallons a day." You think you will require 24 million gallons in about 25 years?

Witness: I think Mr. Gale here proceeds upon the assumption that our present supply gives 40 gallons per head. He subsequently discovered that he had assumed too large a quantity from the existing works. It was in consequence of the difficulties that have arisen, by having to apply for a special Act of Parliament to supply establishments within two miles of the city, that it was deemed expedient to take the power to supply any district which might apply.

Serjeant SARGOOD: If you are driven by your own necessities to come into our district to take our water, do you think it is fair also to ask for power to sell the water to third parties?

Witness: My own impression is that there is abundance of water to supply the whole district of Selkirk, and give to Edinburgh the quantity of water proposed under this bill.

Serjeant SARGOOD: If our Chistian charity is large enough to sacrifice our water in aid of your necessities, do not you think it is rather strong, in addition, to ask for leave to sell it to the public outside?

Witness: No; if, as I have urged, there is an abundant supply, and these works will do nothing more than save the flood water, which is positively of no use to the Selkirk people, I do not think their interests would be prejudiced if these works were executed to-morrow.

Serjeant SARGOOD: Do you mean that the supply of water in St. Mary's Loch is so large, and so continuous, that you can take all this away without any disadvantage to the neighbours?

Witness: Yes; the watershed there is so immense that these works, if executed, instead of prejudicing the manufacturers of Selkirk, would positively benefit them; because, the water being more equally distributed, there would be a better supply during the summer than their minimum supply under existing arrangements. It is proposed to make St. Mary's Loch the natural storeage place, and to raise it so many feet.

Cross-examined by Mr. MUNDELL: Mrs. Scott's house is the only residential property in the immediate vicinity of the loch. I was at the loch in the summer of last year, when there was a very dry season. A portion of the shore near Mrs. Scott's house was left bare, but it did not constitute much of an eyesore. We propose to make the two existing lochs into one. At present there

is a channel, but it is insufficient to float a boat from one loch to the other. Our operations will necessarily lower the level of the water, and create an eyesore, but I doubt if any disfigurement could be seen from Mrs. Scott's house. I think the level of the loch will be lower in the summer time—lower than it is now—by our works. Soundings have been taken, in order to ascertain the amount of beach that will be left uncovered. It will not be so extensive as may be imagined; but plans showing the effect of our operations will be submitted to the committee. In 1842, when the Edinburgh Water Company were under penalty, they paid £5000 for spring water, in order to increase their supply. I do not know the quantity of water that could be obtained from the springs, but the compensation suggested in this case was quite out of all proportion to the quantity of water which would be derived. I believe we received a report as to the capability of an increased storeage of our present gathering-ground to supply Edinburgh, but it was found there had not been sufficient rain the year previous as would fill the existing works.

Re-examined by Mr. POPE: The report of Mr. Lewis stated that we had exhausted the supply from the Pentland Hills, and that any extension of our watershed would encroach upon the ground of the Clyde. With regard to Mrs. Scott, her property has been for sale for a considerable time, and is advertised to be let at the present moment. The water of St. Mary's Loch gets to Selkirk by means of the Yarrow; but the Yarrow is not the only stream which supplies Selkirk. They have also the Heriot and the Ettrick, which latter falls into the Tweed two or three miles below Selkirk. We do not propose to deal with the manufacturers of Selkirk in our bill, but with the river Yarrow. We propose to compensate the river Yarrow for the water we abstract from it, and that is the whole question with regard to Selkirk. If Selkirk gets the same supply it now gets, we conceive it has nothing to do with us in our dealings with the water of the Yarrow. A good deal of the opposition to the bill arises from a fear among the old ladies and sensitive people that the people will drink *chondracanthus*, *lernenoma*, *artemia*, and other insects of ugly shapes and big names, mentioned in the placard produced. The interim report of the 26th October contains the fullest details, both in regard to Mr. Stewart's and Mr. Leslie's estimates, and shows the difference between them. Not a single fact is kept back which can affect the ratepayers case. The whole matter is given, with the exception of the details. The difference was, to a large extent, upon conduits and works, and the sum allowed for contingencies. Councillor Wilson is one of our opponents, but a very moderate opponent. At a meeting of the electors of his ward, he stated the whole of his objections to the St. Mary's Loch scheme, and he there discussed this very difference between the estimates of Mr. Stewart and Mr. Leslie. He moved that both of those gentlemen should appear before the Works Committee and be examined in regard to the estimates. He went into the whole matter, and satisfied himself that the works could be executed for the sum named by the committee.

William Law, Esq., examined by Mr. DENISON.

I am Lord Provost of Edinburgh. I agree with Mr. Lewis that the city of Edinburgh has suffered for a long time from the want of water. The water company were continually obliged to come to Parliament for small additions for their works, and in the end the ratepayers had to pay the cost. We have paid half a million in one way or another for the works. The complaints of our present supply are loud and continuous. Sir James Simpson was one of those who complained before the committee in 1869. If this bill is carried, I think we shall be saved from the necessity of coming to Parliament again with regard to water for the next hundred years—at any rate for a long time. I have received, since I came into this room to-day, a statement of the actual population of Edinburgh, Leith, and Portobello, as shown by the returns taken by the registrars this census. It is 254,093. In February last I visited St. Mary's Loch during the frost. The loch was covered with ice, except in certain places, where we found holes and springs, 30, 40, and 50 feet deep. The ice was from 6 to 10 inches thick. I took samples of the water home. They were taken from these holes. I tasted it, and it appeared first rate. It was submitted by scientific persons to the microscope. I failed to discover in it the things mentioned. That discovery was made since. The water was found to be perfectly pure, without a vestige of colour.

Cross-examined by Mr. RODWELL: The ice was from 6 to 10 inches thick. I attribute the different thicknesses to springs. I consider this is the most suitable scheme for Edinburgh, because it provides such a large quantity for the future. For the last five years the want of water has been exceedingly apparent, and I think nothing less than 50 gallons per head per day would be satisfactory.

Cross-examined by Mr. WILL: I think it is a mistake to sell the existing works. Besides Galashiels we propose to supply a little town called Cursturphine. We do not propose to supply the railway company. We shall not diminish the supply to Selkirk; it would not be fair.

Cross-examined by Serjeant SARGOOD: The amount of water we require at present is 12 million gallons, and we propose to compensate you with 15 million gallons until we require the whole of the 24 million gallons. I suppose you must get the difference between the 12 and the 24 million gallons. We do not propose to store it up now, and take it away in the future. When we do begin to use it you will not get it, and we must provide for that.

Cross-examined by Mr. MUNDELL: I think Mrs. Scott's property will be improved. Our works will not leave more of the surface of the loch bare than at present.

Re-examined by Mr. RODWELL: It is quite a common thing in water bills to insert a clause giving power to sell what water the promoters do not require. Cursturphine may be called an outskirt of Edinburgh.

WEDNESDAY, APRIL 26.

Provost *James Watt*, examined by Mr. CLERK.

I am provost of Leith. I was appointed a magistrate of that town in 1860, and provost in 1866. Ever since I entered the council at Leith I have heard great complaints concerning the water supply, and frequent representations on the subject were made to the corporation and the late water company both in writing and by deputations. Hopes were always held out to us of an increased supply. We have had plenty of promises, but no water. In 1862 the General Police and Improvement Act was passed for Scotland. It was drawn up by my predecessor in office, Mr. Lindsay. The Act was adopted in Leith in October of that year. Under the Act of 1862 we can compel landlords to put sinks and water-closets into all houses which have room for them. In accordance with the provisions of that Act, we caused a great many water-closets to be put into houses in Leith; but, in consequence of the utterly insufficient supply of water, we were not only obliged to discontinue the practice, but, yielding to the representations of both landlords and tenants, we allowed parties who had put in water-closets to shut them up. On several occasions when fires have occurred, there has not been a sufficient supply of water in the mains for the purpose of extinguishing them. From the beginning of June last year, up to December, the scarcity of water was something dreadful. The whole town was always in a state of alarm in consequence of the want of water. We are supplied at Leith by the same sources which supply Edinburgh. In consequence of the state of things last autumn, the magistrates were in very great alarm. There was a great deal of scarlatina in Leith then, which the medical men attributed to the want of water. In our narrow closes a good supply of water is very much needed. In October last all the inhabitants were suffering great privations through want of water. To relieve them as far as we could, the magistrates applied to parties to allow their private wells to be opened, in order that the people might carry a supply from them. There is a small loch of water within the limits of the burgh of Leith. It is called Lochend, and is the property of the corporation. The water is quite unfit for domestic use, but it is used for manufacturing and sanitary purposes, such as watering the streets. We went to some expense in pumping water from this loch for sanitary purposes. The pipes from the loch are laid through the town. Formerly I believe the people used it for every purpose, but now the water, as analysed, is quite impure and unfit for domestic use. The pipes having been put down through the town, we were at the expense of attaching new pipes; but we put up large placards to tell the people not to use the water for cooking purposes, but only for washing purposes. Some parties attributed the high death-rate in Leith last autumn to the use of the Lochend water, and this matter must have reached the ears of the Registrar-General; for in his report he attributes the large death-rate from diarrhœa and scarlatina to the use of this water. Statistics showed, however, that a large number of deaths from these causes occurred previous to our allowing the Lochend water to come in. I was instructed by the Town Council to write to the Registrar-General telling him that he was misinformed. Some persons having been very much pressed for water may have used the Lochend water for domestic purposes. I explained to the Registrar-General the circumstances under which the Lochend water was taken. He was satisfied; but said he considered a large additional supply of water was necessary for Leith. If there was an efficient water supply in Leith, I have no doubt manufactures would very largely increase. The desire is universal for an improved supply. I have personally examined the different sources of supply. I decidedly prefer the St. Mary's Loch. Some signatures to the opposing petition have been obtained in Leith. I was certainly surprised at that, considering the feeling in favour of an improved supply. I know, if I had gone from house to house, and represented that the water would be good and cheap, I could have 20,000 signatures on our side. The population of Leith by the last census was 47,000, and it is increasing. The shipping require a large supply of water to take to sea.

Cross-examined by Mr. WILL: Some of the pipes in Leith are still in a bad condition, because they were laid by the late water company; but we shall get that matter looked to. We know the main running down to Newhaven is bad. With regard to the waste, I believe our plumbers work is good, and we have appointed inspectors to make visitations.

By the CHAIRMAN: 254,000 includes the population of Edinburgh, Leith, and Portobello, and represents the total number of persons to be supplied.

By Mr. WILL: The Lochend water is not sufficient for manufacturing purposes. The flour-mills get water from the company's mains as they can, and Messrs. Todd's works would have been shut up if they had not pumped water out of the docks. The canvas, hemp spinning, and paint works, all require steam power. They have been obliged to sink wells at an enormous expense, otherwise they could not get sufficient water from the old water company or the trust. They would rather take their water from us. We have had no public meetings, except ward meetings, to discuss the question since 1868. I consider the feeling in Leith so strong that it was not necessary to call a meeting. The Messrs. Todd, of Leith, who own, perhaps, the largest flour mill in Scotland, are divided on the bill. It was the younger member of the firm who signed the petition. The water-rate will depend greatly upon the cost of the works. I am aware that Mr. Leslie's original estimate was £750,000, but he has since lowered it. If we cannot construct the works for £480,000, I do not know that the rate will necessarily exceed one shilling in the pound. I believe the want of water has prevented many manufactures being commenced in Edinburgh. I know, if there had been an adequate supply in Leith, we should have had another large sugar refinery.

Cross-examined by Serjeant SARGOOD: I cannot tell whether the Leith manufacturers use condensing engines, and brew their water over again. I cannot give an idea of the proportions of the manufacturing and domestic wants. I agree that the Selkirk manufacturers ought not to be put in a worse position by our taking their water.

Re-examined by Mr. CLERK: We have a sugar refinery in Leith, and a larger amount of water is required in refining sugar than in any other manufacturing process. But for the scarcity of water, we should have had another refinery in Leith by this time. The statement made before the parliamentary committee in 1869, that there was 33 per cent. of waste, was an assertion made by the water company. The water company, just before the last bill came before Parliament, laid down a large main to Leith, but, notwithstanding that, we have been even worse since that time.

Provost *Thomas Wood*, examined by Mr. CLERK.

I have been a member of the Town Council of Portobello for nine or ten years. I am a member of the Edinburgh and District Water Trust. I have been three times elected Provost of Portobello. I proposed to cease to be provost last year, but was requested to continue in office until this water question was settled. In October last year I convened a public meeting for the purpose of nominating three members of the Town Council, and it was then that I proposed to resign, but I agreed, by the will of the meeting, to remain in office. The population of Portobello is 5478. Portobello is a watering-place, very much resorted to, and is increasing in size. At the time of the meeting to which I have referred, every person who read the papers and took any interest in public matters, was well acquainted with the subject, and with the different schemes brought forward for water supply. There was not a single objection raised at the meeting to the St. Mary's Loch scheme. I have taken great interest in this question of water supply since I have been connected with Portobello. For six years there have been continuous complaints about scarcity. The prosperity of Portobello depends very much upon its healthiness and cleanliness, as it is the resort of visitors from England and from all parts of Scotland during the summer. We take water from the Edinburgh Canal for flushing our sewers and for sanitary purposes, in consequence of the scarcity. We have a very complete system of drainage, but the drains were becoming blocked up, and but for the canal water it would have been a very serious thing for us indeed. During September last year we had only an intermittent supply, being 24 hours without water and 12 hours with water. Some houses about the higher parts of the town were without water for days together. We have suffered in Portobello, in cases of fire, from the want of water. In one instance a house was totally destroyed because there was not sufficient pressure on the mains. With the other trustees, I visited the various sources proposed for obtaining water. I was not in any way wedded to any of the schemes proposed. I am strongly in favour of the St. Mary's Loch scheme as being the best and the most economical. The opposition to this scheme has a little support in Portobello, but not much. I think it is caused simply by the representations made in the newspapers as to the quality of the water. Many have been frightened by these misrepresentations, but not by the cost. A number of letters which appeared in the papers above the signature of "A Physician" attracted some notice. At Portobello there is a fine flat beach of very fine silky sand.

Cross-examined by Mr. WILL: I believe there has been an opposition got up against the scheme through the influence of the water company. I know that the water company have paid a number of witnesses their expenses for attending here as representing the ratepayers. I am aware of the petition signed by 14,000 people. We were badly off for water in Portobello previous to September, but in that month we were reduced to an absence of water for 24 hours. That year was exceptionally dry. I do not suggest that the opposition is not an honest one.

Re-examined by Mr. CLERK: Besides the letters of "A Physician," there were very many other representations, or misrepresentations, as to the supposed purity of the water.

Mr. *Andrew Archibald*, examined by Mr. CLERK.

I have been a member of the Town Council of Leith since 1866. I am one of the water trustees. Excluding the military and shipping, the population of Leith is 44,000. In 1855 and 1856 the rental was £126,276, while in 1870 and 1871 it was £224,029, excluding railways. We have been very badly supplied with water in Leith since 1860. Leith has been even worse than Edinburgh, and the deficiency is again increasing. It is not uncommon for a whole tenement to be without water for weeks and even months. The water-closets in those houses have got choked up, and a great nuisance has been created. We have no water for flushing the sewers, and had to sink a well for that purpose. In cases of fires we have almost universally to wait half-an-hour before sufficient is obtained, and great destruction to property has resulted in consequence. The trustees have been only able to give an intermittent service, the water being 24 hours off and 12 on. We had a large tenement burned down in Leith last year entirely owing to want of water. That is a state of things which it is most dangerous to continue. The extension of public works in Leith is very much hampered for the want of water. I have carefully considered the different sources of supply which have been suggested, and have also considered the reports regarding the quality of the water, and my opinion is still unchanged that St. Mary's Loch is the best source of supply. I was not wedded to any particular scheme in 1869, when Parliament created the water trust. I would have adopted any one which would have given sufficient water. At the Leith ward meetings in October last, the water supply was specially alluded to. At that time discussions had appeared in the newpapers as to the purity of the water of the St. Mary's Loch, yet the result at all the meetings was that no one unfavourable to the scheme was elected. Since then several parties have succeeded in getting signatures to a petition against the scheme. I called upon a few who had signed, or who were represented to have signed, and I found that they had done so under the misrepresentation that the water rate would be 2s. 6d. in the pound, and that the whole scheme would cost a million of money. It was also alleged that the water in St. Mary's Loch was so bad that the cattle would not drink it. By these misrepresentations the opponents managed to get some signatures, and in some instances they got the wives to sign for their husbands. I found four cases of that sort in one stair or tenement. The general impression in Leith has been almost uniformly in favour of the scheme, and there would have been no opposition but for the misrepresentations made by those who were hawking the petition about.

Cross-examined by Mr. WILL: I introduced larger cisterns some time ago, but I am sorry to say that has not alleviated the distress, as there was no water in the Leith cisterns for two months last summer. Leith has always been worse supplied than Edinburgh. Mr. Gale reported, when we took possession of the works, that the water available for distribution was 7 million gallons per day—that would be 27½ gallons a head. It turned out, unfortunately, that it came down to about 3½ millions last summer; the reservoirs were so dry that it was remarkable. It was 375 cubic feet per minute at the end of September. I cannot say who is responsible for the statement that the supply was 3½ millions of gallons per day; but I presume that the 375 cubic feet per minute, upon which the estimate was based, was taken from the books recording the supply, and for which Mr. Cameron or Mr. Stewart would be responsible. The fact is, that a very large supply was sent in during the winter months; and, when the summer came, the population were reduced to what I may describe as starvation-point. I know nothing of the water supply of English towns. It may have been reported by Mr. Gale that the supply to seventeen of the largest cities and towns in England and Scotland, in 1866, was 28 gallons per day per head of the population, while the Edinburgh supply was 32 gallons; but I am unable, from want of knowledge, to give any opinion upon the subject. All I can say is, that Mr. Gale in his statement under estimated the population who had to be supplied. The water trust could now send in 40 gallons per head per day; but they had much better keep it until the hot months, when the sources of supply will be to a great extent dried up. With regard to Mr. Gale's remarks on the question of different fittings being sufficient to prevent waste of water, all I can say is, that Mr. Gale, having charge of the Glasgow supply, has not succeeded in keeping down the waste there, and that in Edinburgh, with the assistance of competent inspectors, referred to yesterday by Bailie Lewis, the effect which he has predicted has not resulted, for there was, unfortunately, little to waste. Where the fittings have been faulty we have replaced them with others.

By the CHAIRMAN: I agree with the evidence which was given yesterday by Bailie Lewis.

Re-examined by Mr. CLERK: I cannot speak in reference to the English water supply as compared with that of Edinburgh, because I do not understand the construction of English houses, which is different from that of houses in Scotland. The mill-owners are entitled to a supply of 220 cubic feet per minute, and when the supply falls short of that, by the reservoirs remaining low, the water from Crawley spring has to be turned on to make up the deficiency. The great reservoir in the Pentland Hills was dry last year; there was nothing but mud.

Mr. CALVERT stated that he desired to call two witnesses to prove that a ficticious petition had been presented from Leith, purporting to be signed by a number of people against the bill. He hoped that the committee would allow an inquiry into the facts of the signing and presentation of the petition, as it involved a question of breach of privilege of the House.

The CHAIRMAN suggested that a witness should be examined on the point.

Mr. *Wm. Chambers*, examined by Mr. CALVERT.

I am the proprietor of "Chambers's Journal." I was Lord Provost of Edinburgh in 1868, when the other bill was before Parliament. I have taken a great deal of pains, in travelling abroad, to inquire into the social and sanitary condition of large towns. I have written numerous papers on the subject, and have investigated the whole subject. I accepted the position of Lord Provost, at the request of a large number of citizens, with the view of improving the sanitary condition of the city. The Old Town was in an exceedingly bad state. The buildings are very antiquated, and from three to four hundred years old. It is a very common practice to have closes diverging right and left, which are little more than 3 to 4 feet wide. The state of these closes was appalling, containing houses built without any provision for drainage or water. The refuse had to be carried down and the water carried up the common stairs from public wells provided by the authorities.

By the COMMITTEE: The houses are six or seven storeys high, and are only divided by 3 or 4 feet.

By Mr. CALVERT: Owing to the want of water in these closes, and the want of fresh air, the death-rate is very great. That has led to a great deal of intemperance, as low vitality always does. I tried to improve this state of things, and the result was the City Improvement Act of 1867, the main object of which was to open up these closes and form new streets. I remained several years in office to carry forward the improvements as far as possible. They are well adapted to improve the vitality of Edinburgh. In order to carry out my plans, it is absolutely necessary to have not only an ordinary but a copious supply of water. The death-rate in the better part of the New Town is 7 per 1000, and in the Old Town 39 or 40. I have looked at the water question in various ways, and I think St. Mary's Loch offers the greatest advantages. I know St. Mary's Loch very well. It is really good water. I have always found the water clear and pleasant, and nothing offensive about it. It is absolutely necessary to obtain a large supply of good water from St. Mary's Loch or some other place, and I think it would be a great waste of money to take it from an imperfect source. Edinburgh is increasing rapidly, and we must have water from a continual source of supply. The tastes of the people are improving. They now require better accommodation and a greater supply of water. Baths and water-closet are coming into more general use. People who had not a single water-close before, have three or four now. Habits of cleanliness always tend to improv the morals of the people and decrease drunkenness. In houses where you find wretched accommodation you generally find intemperance. As a well-wisher of Edinburgh, I consider a copious supply of water absolutely necessary.

Cross-examined by Mr. WILL: The old houses in Edinburgh are divided into flats, and the flats into rooms, and the only way to remedy the overcrowding is to pull the houses down. I have seen one room inhabited by five or six people. The system in Edinburgh is to have the water-cistern at the top of the house, but I think it is a bad arrangement. Hume's Close and Coul's Close are as narrow as 3 feet.

Cross-examined by Serjeant SARGOOD: I don't dispute that good water could be obtained from the Heriot, but from personal knowledge of St. Mary's Loch I consider it offers superior advantages from being a natural lake. I have not tasted the Heriot water, and I am not instituting any comparison. I would prefer the Heriot for distance, out it has not got a sufficient supply for our wants. I understand the Selkirk people will get a sufficient supply by storeage. Means will be taken to meet their wants. I merely glanced at "Physician's" letter.

Cross-examined by Mr. MUNDELL: I had a fair water supply in 1869 for all purposes. I think in March, 1868, there was a deficiency. If I were living on the banks of the loch, I should not like the amenity disturbed. The water would be reduced 2 or 3 feet, but there is a beautiful stony beach, and, if I were Mrs. Scott, I should not object to more beach. With a slight exception the beach is good, and it is not muddy.

Re-examined by Mr. CALVERT: St. Mary's Loch, of all Scottish lakes, has the remarkable peculiarity of being extremely clear. The bottom of the lake is generally stony. The Heriot water feeds the Gala, and I do not think the manufacturers of Galashiels would allow their supply of water to be seriously interfered with.

Mr. *John Carrick*, examined by Mr. CALVERT.

I am master of works, city architect, and surveyor of streets at Glasgow, and have been so for upwards of twenty-seven years. A number of years ago, the interests of the different water companies were acquired, and the Loch Katrine supply brought in by the City authorities. There was much opposition to the measure. The people of Glasgow consumed about 50 gallons per head. The rates have diminished. During the progress of the works it was 1s. 4d. in the pound, and it is now reduced to 8d. Since the Act was obtained, some fifteen years ago, the supply has greatly increased. The present supply is now very popular.

Cross-examined by MR. WILL: The trade consumption of Glasgow is derived from the Clyde. I cannot tell how much water goes to waste. The mortality is greater now in the New Town of Edinburgh, notwithstanding the enormous supply of water. I do not know that the estimated cost of the Glasgow works was £596,000, and the actual cost £900,000. In taking its supply from Loch Katrine, Glasgow does not interfere with any other town taking its supply from the same source. Compensation of the most ample kind was given to mill-owners.

Re-examined by MR. POPE: Supposing the source of the Selkirk supply to be made as good as it was before, I cannot conceive any ground of complaint. The opposition to our scheme asserted that it would involve a 3s. 6d. rate.

Dr. *H. D. Littlejohn*, examined by Mr. POPE.

In 1854 I was appointed surgeon of police in Edinburgh, and in 1862 medical officer of health. In both capacities I have come largely in contact with all classes of the community. I have considered the water supply as one great element in the sanitary condition of the city since 1854. Edinburgh has suffered severely in summer from the scarcity of water. The chief complaints have come from the poor. The larger class of houses have private cisterns. The poor inhabitants depend very largely upon the public supplies. There are no private wells in Edinburgh except those used by the brewers. There are what are called public wells, numbering about fifty, which are supplied by the corporation with water. During the existence of the water company it was constantly applied to during the summer by the poorer classes of the inhabitants respecting the want of water. In 1870, when the water-works came into the hands of the corporation, there were a few such complaints from the poor. It is of great importance to the health of a community that the poorer districts should be attended to. In the summer of 1870 diseases were prevalent in the city to such an extent as to render a better supply of water especially desirable. The mode of living in flats, so common in Scotland, is conducive more or less to disease. It leads to great overcrowding and great immorality. Overcrowding exists in Edinburgh to a most alarming extent—on one stair in the Cowgate there are 250 individuals living. The house consists of six storeys, and on each storey there are 12 families, and in all 250 individuals communicating with the street by a single door. With regard to sewage arrangements, Edinburgh particularly requires an abundant supply of water, and I have no hesitation in saying that, as compared with English towns and the large majority of Scotch towns, Edinburgh requires to be exceptionally dealt with as regards water. In all recent Acts the Corporation have taken power to introduce water-closets. It is extremely desirable to increase these conveniences, but we have had to shut them up in many cases, and we cannot introduce them into the houses of the poor without an abundant supply of water.

By the CHAIRMAN: Moule's earth-closets are not suitable to Edinburgh. We are trying the experiment, but my opinion is that it will not succeed.

By Mr. POPE: If we had an abundant supply of water, water-closets would be preferable. In addition to the system of living in flats, a great number of the working-classes live in closes or alleys. These closes prevail largely in the Old Town. Between the Castle and Holyrood there are 150 of them, and that embraces only a small portion of the Old Town. From one of these closes as much as a ton of filth, with other refuse, has been removed in a day. That has to be brought night and day into the streets, and is removed by the scavengers.

By the CHAIRMAN: That necessitates a very considerable amount of police supervision. If the matter were allowed to accumulate it would create a perfect nuisance.

By Mr. POPE: When the matter is moved into the streets, it is desirable to have an abundant supply of water for flushing, to carry away the matter as soon as possible; and to talk about waste in removing the matter is simply ridiculous. I may say that the corporation are only able to flush these closes once a-year. I think it ought to be done, if possible, twice a-day. I have not the slightest doubt it would be followed by a decrease in the death-rate. In fact, it is a question of life and death to the poor. Ultimately, fashionable places like Moray Place, and other places in New Town, suffer from this state of things, because, when fever breaks out in the lower districts, it spreads to the higher parts of the town. The condition of the sewers last year was exceeding bad, owing to the want of water. The corporation have taken special care to trap the eyelets in the poor districts. It is only in the outlying districts where there are no traps. Last summer a great many of the traps were inoperative, and the noxious gases of course escaped. A few years ago as many as 646 individuals lived on each acre in these closes, that being the thickest population in the world. In 1869 the mortality was 30 in the 1000, and in 1870 it fel to 25. That decrease, if not in consequence of, was coincident with the better supply

of water to the town. The poorer classes don't care whether the water is brought from St. Mary's Loch or the Heriot, like those who are able to pay for parliamentary opposition. All they want is water, and they will be delighted to get it from St. Mary's Loch or anywhere else. I visited St. Mary's Loch and the Heriot in company with Dr. Stevenson Macadam. The gathering-ground of the Heriot is mossy and peaty. On Friday, the 14th inst., it was muddy. Peaty water is not necessarily unwholesome, and will lose its colour if stowed in the reservoirs for some time. I found the Yarrow leaving St. Mary's Loch in large volumes. The water was as clear as crystal, and the water in the loch itself was also quite clear. We could see the shingly bottom 200 feet from the shore. We visited the tributaries flowing into the loch, and found the water very clear. The weather at the time of our visit was exceeding wet, and thus both places were put to a severe test. We inspected the stream connecting the two lochs, and found it also clear. Fifteen years ago I practised at Selkirk. I have had frequent opportunities of testing the water at St. Mary's Loch. Better water could not be found, and I have never seen any fleas. In my opinion that water is perfectly wholesome. It was not flat to the taste, but brisk and pleasant. There is little difference between St. Mary's Loch and the Heriot, so far as quality is concerned; but in the case of St. Mary's Loch there is a natural reservoir, while in the case of the Heriot the water must be impounded. Water is more likely to receive impurities from an artificially constructed reservoir than from a natural one. My attention has been directed to the conveying of water through lead pipes, and I am quite convinced that the St. Mary's Loch water can be introduced into Edinburgh without any danger of lead poisoning. There is no practical difficulty with regard to the Loch Katrine water of Glasgow, which is the softest water I know of.

(To be continued.)

Legal Intelligence.

GUILDHALL POLICE COURT.

TUESDAY, JULY 18.

(*Before Alderman* WHITE *and Alderman* FINNIS.)

THE GASLIGHT AND COKE COMPANY *v.* DOCKING.

Mr. POLAND, Q.C., appeared for the complainants, and Mr. BESLEY for the defendant.

This was a summons taken out by the Gaslight and Coke Company, under the 19th section of the Gas-Works Clauses Act, 1847, against the defendant, the London agent of Mr. Buckham, a gas-regulator manufacturer of Camden Town, for wilfully removing a piece of pipe belonging to the complainants, and for wilfully damaging a pipe belonging to them.

Mr. POLAND, in opening the case, said he could assure the bench that there was no desire on the part of the complainants in any way to interfere with the use of gas-regulators, provided they were fixed upon the pipes belonging to the consumers, and not on those which were the property of the company. The Act of Parliament under which the present summons was obtained contained a provision for preventing persons interfering with their pipes, and it enacted that the wilful removal, destruction, or interference with any of such pipes, or the wilful extinguishing of any of their lamps, rendered a person liable to a penalty not exceeding £5. The object of these proceedings was to put a stop to a practice which the company felt was a dangerous one, and which exposed them to serious responsibilities. Certainly there could be nothing unreasonable in this. The company supplied gas to the consumers, and, if the pipes by which that supply was furnished stopped in the public road, there would be no difficulty in the matter, because they were only responsible so long as the pipe by which the gas was conveyed was their property. But the company let meters to the consumers, and they were, therefore, responsible for the gas being brought safely into their dwelling-houses through the pipes into the meter, and through the meter into the pipe which belonged to the consumer beyond it. If any accident arose during the progress of the gas so far, the company would be liable to pay the damage, and it therefore was essential that they should be protected from the interference of other people than their own servants with any of these pipes. It would be unreasonable that they should be responsible for the consequences of an accident, if such interference were allowed. He did not wish to go into the question of the merits or demerits of what were called "gas-regulators," but he might say that the complainants believed some of those at present in use were injurious and dangerous. Still they had no objection to their being fixed, if the consumer wished to have them, provided, of course, that they were fixed on his own pipes. The meters which the company supplied were furnished with outlet-pipes, and their property ceased with the brass union, at a distance of about two feet beyond the meter, to which union the consumer's pipe was attached. If the consumer chose to employ a regulator, let him fix it where he liked on the other side of the union, because then, if there were any escape of gas, the responsibility would be his own; but the company objected altogether to its being fixed on their outlet-pipe. So strongly, indeed, did they object, and so important did they consider it that they should be protected from all interference with their property—either their meter or pipes—that they would press upon the bench for a decision, after hearing the evidence to be submitted in the present case, in order that, if necessary, that decision might be reviewed by a superior court. With regard to the section of the Act of Parliament, he submitted that the only thing he had to show was that the pipe in question was the property of the company, and that this pipe had been cut, removed, or interfered with by the defendant, who was summoned to answer the charge on this occasion. The company did not proceed against the defendant, under the Consolidated Statute, for "maliciously" damaging their property; the section under which the summons was issued was for "wilfully" doing it, which he should contend meant designedly, and not accidentally. If the pipe of the company was damaged by the defendant otherwise than by accident, it was a wilful damage. For instance, if he took a chisel and cut it, or ordered a servant of his so to act, the damage was wilful, though not perhaps malicious. In the case of *The Queen v. Learoyd* (Mooney and Robinson, p. 339), the charge against the defendant was for wilfully placing rubbish upon a railway for the purpose of obstruction, and Justice Maule told the jury that, if rubbish had been accidentally placed by the defendant on the line, he would not be guilty; but it was by no means necessary, in order to bring the case within the statute, to prove that he threw the rubbish there expressly with a view to obstruct the engines and carriages. If he designedly placed any substance upon the line which would have a tendency to produce an obstruction, that was an offence within the Act. The jury asked what was the meaning of the term "wilful" used in the statute, and the learned judge said he should consider the act to have been wilfully done if the defendant placed the rubbish on the line knowing it was a substance likely to produce an obstruction, or if he had done it in order to throw upon the company's officers the trouble of removing it. In the present instance two of the outlet-pipes of the meter had been cut asunder, and a third had had the brass union cut away, and nearly the whole of the outlet-pipe removed by the person who did the work of putting up the regulator. The company desired, through him, to assure the bench that they had no hostility whatever to the use of these regulators, provided they were fixed upon the consumers pipes, but they could not sanction or overlook such an interference with their pipes as had taken place, not only because of the damage to their property, but because of the liability it entailed upon them in the event of an escape of gas, should the work of fixing the regulator not be properly done.

Mr. BESLEY denied that any part of the company's pipe had been taken away. The regulator was introduced, and the pipe replaced. A piece of pipe was cut out, but another piece was put into its place.

Mr. POLAND said the regulator was substituted for the piece of pipe.

Mr. BESLEY said every one would suppose from the statement of his learned friend that the pipe had been removed.

Mr. POLAND: Not removed so as to let the gas escape.

Alderman WHITE: Removed for the insertion of the regulator.

Mr. POLAND said there was an actual piece of pipe cut out, and that piece so cut out was taken away, and the regulator substituted. Why could not the defendant, and those who acted with him, place their regulator on the consumer's pipe, which could be done with perfect ease, or else come to some arrangement with the gas company, so that some of their workmen might be present to see the work properly done? The 19th section of the Gas-Works Clauses Act was expressly introduced to protect the company from such proceedings as the defendant had been guilty of, because it would be unjust to hold them responsible for any accidents which might arise, unless they were entitled to preserve the integrity of their pipes and meters.

Alderman WHITE asked to be shown where the substitution of the regulator for the company's pipe had taken place.

Mr. JOHNSON, the company's chief inspector, produced a meter and explained the matter.

Mr. BESLEY said the object of the regulator was to prevent a waste of gas. It was so adjusted that, supposing there were 40 lights, and 39 of them were extinguished, the pressure upon the remaining light would continue the same, and gas would not be forced through unconsumed. The regulator was invented in the interest of the consumers, and he contended that the gas company had no right to put a pipe beyond the meter as they had done, so as to prevent the use of this apparatus. The customer did not want this pipe, and he claimed the right, so soon as the gas had passed the meter and been registered in the interest of the company, to put on a regulator to adjust its consumption in his own interest. Undoubtedly it was a most successful invention, and tended to reduce the dividends of the gas companies, because it prevented the waste of gas. The company in the present case came forward, and asked the bench to convict the defendant under a criminal section of the Act, for wilfully damaging their property, although, as he (Mr. Besley) contended, the defendant had only done what he had a perfect right to do.

Mr. POLAND said his learned friend was in error in saying that the gas company put an outlet-pipe to their meter, for the purpose of preventing the use of the regulator. These outlet-pipes were attached to meters before the regulator was invented. Why did not the defendant put his regulator upon the consumer's pipe?

Mr. BESLEY said that would destroy the object of the invention. If the regulator were placed at a distance from the meter, it would not regulate the consumption of gas. The Gaslight Company, who were now the complainants, were the only company in London who put an outlet-pipe like this to their meters. The other companies considered they had done their work when they put in the meter, and they charged the consumers for the piece of pipe.

Alderman WHITE: Did the consumer in this case accept the meter with the outlet-pipe attached?

Mr. POLAND: Yes.

Mr. BESLEY: Because he could not help himself.

Mr. POLAND: We put the meter on the premises, and the consumer accepted it, and while our property remains there it must not be interfered with. My friend is wrongly instructed, or he would not say that the regulator must be close to the meter. It will act as well a yard or two off; that does not destroy its efficiency. I hardly think my friend should have introduced any feeling into this inquiry, and stated that the company wished to promote the waste of gas. It is nothing of the kind. If this is a good regulator the company do not object to its use. Some regulators are absolutely injurious, but this is not so, and if it answers the purpose, let it be taken into every house where the company supply gas, so long as it is thoroughly understood that the property of the company is not interfered with.

Mr. *Thomas Wall*, examined by Mr. POLAND: I am foreman to Mr. Heath, gas-fitter, of Bride Lane. I know Messrs. Smith Brothers premises in Ivy Lane, Newgate Street. I was employed to put up three meters there for The Gaslight and Coke Company. The last I fixed was in April last. They had inlet and outlet pipes attached, as in the meter produced. By means of the outlet-pipe I made the connexion with the consumer's pipes. I have since examined the state of these meters. In one case, with the exception of about two inches, the whole of the outlet-pipe has been cut away; in the other two cases, a little more of the pipe has been left, and regulators have been substituted. There was nothing dangerous with regard to the escape of gas in the way these regulators had been fixed. I communicated with Messrs. Smith on the subject, and referred them to the company. The outlet-pipes were about 1 foot 9 inches in length, and the value is about 9d. per foot.

Cross-examined by Mr. BESLEY: I did the work for Mr. Heath, who is occasionally employed by the company to fix meters. I have worked for Messrs. Smith for years, and also for the gas company. I have worked for other companies also. I know that they charge the consumers for the outlet-pipes at so much per foot. As far as I know, the complainants are the only company who insist upon retaining their property in the outlet-pipe.

Mr. BESLEY: I suppose the nearer the regulator is to the meter, the more efficient it is?

Witness: Decidedly not. There is a gentleman in court for whom I fixed a regulator, and I fixed it half way between the meter and the place where the gas was consumed.

Mr. POLAND: How far was it from the meter?

Witness: I should say it was 30 feet.

Mr. BESLEY: But in that case you have not made any experiment to test its efficiency?

Witness: I am sure it is efficient.

Cross-examination continued: The position in which the regulator can be placed depends upon the premises. Mr. Smith made no complaint to me about these regulators. When I went to the premises the supply of gas was going on all right.

Mr. BESLEY: Then, according to the construction of the premises and the position of the outlet-pipes, it may be more convenient to the consumer to have the regulator close to the meter?

Witness: No; it is only for the convenience of the proprietor of the regulator that it is put close to the meter. I am sure, however, it was not so in this case. It would have been better to have put it two or three feet further off. If I had been employed to fix it, I should have done so.

Cross-examination continued: The complainants will allow a consumer to have his own outlet-pipe, if he likes to pay for it. They will not allow him to fix it. A consumer may supply his own meter, if he prefers it. I know other places than Messrs. Smith's where these regulators are in use. To a certain extent they do regulate the consumption. It is quite true that when, from over pressure, gas makes a noise at the burner, it is being wasted, and that it is then liable to injure pictures and ornaments in a room. It is essential to regulate the supply to the burners.

Re-examined by Mr. POLAND: The regulator to which I referred as fixed at 30 feet from the meter acts well, and I have heard no complaint about it. In the present case there would have been no difficulty in fixing the regulator on the consumer's pipe.

Mr. BESLEY: There is no Act of Parliament to compel us to fix it 30 feet away.

Mr. POLAND: If it were one inch off our pipe, we should be satisfied.

Mr. BESLEY: You have no right to put a pipe there at all, or to charge the consumer for it.

Mr. *Frederic Thurston*, examined by Mr. POLAND.

I am one of the inspectors of The Gaslight and Coke Company. Our company supply inlet and outlet pipes with their meters. The outlet-pipe extends up to the brass union. Both remain the property of the company. In consequence of a communication made to me, I went to the premises of Messrs. Smith, Ivy Lane where I found that the outlet-pipes of the three meters had been cut, and regulators inserted.

Mr. BESLEY said it was not necessary to have these facts taken down two or three times.

Mr. POLAND said he did not wish to multiply evidence, but he did not know what point his learned friend intended to make.

Mr. BESLEY said if there was any evidence to show that Docking put up the regulators, it had better be given.

Examination continued: There would have been no difficulty whatever in attaching the regulators to the consumer's part of the pipes in these particular premises. The company would have no objection to their use if put up just beyond the union. Up to that place the company are responsible for any accident which might arise. We always supply this pipe, and the company's servants fix it.

Cross-examined by Mr. BESLEY: Consumers might, if they pleased, supply their own meter, but I have never, in my experience, known them to do so. If they did, we should not supply the outlet-pipe, and they might employ whom they chose to fix it, upon giving us notice of the fact. We have power to go upon the premises, at any reasonable hour of the day, to inspect the state of the meter. I cannot say whether our company are alone in the practice of supplying outlet-pipes. I do not think it is equally convenient to have the regulator placed where it is to having it at a distance from the meter. The reason why we desire it to be at some distance is that, in some cases, meters require to be changed, and when the regulator is fixed as it is in this instance, it would take a man almost a day to remove and refix it. We do not charge a rental for the use of our meters in the City of London, and we should not charge a consumer with the cost of removal.

Alderman WHITE: Is it a fact that you make no charge for meters to any consumers?

Witness: Not in the City. Outside the City we charge a rental.

Cross-examination continued: I have myself objected to the use of these regulators, when fixed in the position we now complain of, for the reason I have given of the trouble occasioned when a change of meter is necessary. At the present moment, I cannot give an instance of having to change a meter where a regulator was so placed. I told Mr. Smith that Messrs. Petter and Galpin had used these regulators, but had had them removed because they did not answer. It was a mistake as to the name of the firm; but one of our inspectors had informed me of a case in which these regulators had been opened, and the interior taken out, and they worked just the same. I did not make the statement to discourage the use of the regulators, except that in changing our meters they are a great nuisance to us, and that they prevented, in this case, a sufficient supply of gas being given to the consumer.

Re-examined by Mr. POLAND: I had heard that one firm had removed the regulators because they could not get a sufficient supply, and I mentioned it to Mr. Smith, and as far as I know the facts were accurate, but I made a mistake in the name of the firm.

Mr. *G. P. Smith*, examined by Mr. POLAND.

I am a member of the firm of Smith Brothers, of Ivy Lane, bookbinders. I cannot tell whether the meter and outlet-pipe were supplied to us by the company, but we did not supply them ourselves. No charge has been made to us for the use of them. About the beginning of May last, we ordered regulators of Mr. Duckham, of Pratt Street, Camden Town, and they were put up by Mr. Docking, who is the London agent for Mr. Duckham. The bill was made out in Mr. Duckham's name. I believe we paid Mr. Docking. After Mr. Thurston, the gas company's inspector, had spoken to us, my brother wrote a letter to Mr. Duckham. Mr. Docking then called on us, and went to look at the regulators. I told him the company's representative objected to their being in the position in which they were fixed—that they were too close to the meters on their outlet-pipe. Mr. Docking said they were not too near, and that he had not broken the law in that respect.

Mr. BESLEY: That is your idea of what he said.

Witness: He said he was right, and the company were wrong, as near as I can recollect. My brother afterwards wrote to Mr. Duckham again; that was on the 18th of May.

Mr. POLAND proposed to read a copy of the letter.

Mr. BESLEY objected that it was not evidence.

Examination continued: Mr. Docking called subsequently, and brought a workman with him. They examined the position of the regulators, and the workman, I believe, said it was all right. Mr. Docking said the company might do what they liked. They left without making any alteration.

Cross-examined by Mr. BESLEY: We have been customers of the gas company for the last 20 years. I first heard about these regulators some six weeks before we ordered them to be put up. We understood that they would prevent the waste of gas, and that Mr. Duckham, the patentee, would keep them in good condition and perfect working order for a period of three years free of cost. That was a part of our agreement with him. Our agreement was with Mr. Duckham, Mr. Docking coming to represent him. Our attention was called by his circular to the number of public companies and private individuals to whom these regulators had been supplied.

Mr. BESLEY was proceeding to ask questions based upon the statements in defendant's circular.

Mr. POLAND: This is not evidence.

Mr. BESLEY: I dare say it is very trying to the gas company to hear it.

Mr. POLAND: I should think Messrs. Smith did not have these regulators because they supposed them to be bad ones.

Cross-examination continued: We ordered them, looking at the statements made in the circular. Mr. Thurston rather alarmed us when he came. He made all the objections he could to their use—said they were dangerous, and made it very doubtful whether we ought to have them. He stated also that Messrs. Petter and Galpin had had them removed, but my brother ascertained that such was not the fact. Since we have had the regulators the supply of gas has been perfectly satisfactory, but we have not had our account in from the gas company yet. The putting up of the regulators was with our entire consent. We saw Mr. Docking, the agent of Mr. Duckham, as the engineer. Mr. Duckham's workmen did everything; Mr. Docking did nothing with his own hands. Everything was done properly, as far as I know. If the company had asked us to pay 1s. 6d. for their little bit of outlet-pipe, we should not have objected. Whatever was done in connexion with this "wilful removal" we were cognizant of from first to last, and approved. Assuming that we save 40 per cent. on our gas bills by the use of the regulator, we have no objection to find our own meter.

Re-examined by Mr. POLAND: We did not select the place where the regulator should be put. I was surprised that it was put where it is, because it was so inconvenient to the parties fixing it. We did not sanction their being put in any particular place.

Mr. POLAND: My friend has asked you about the regulator—does it prevent the gas fixing?

Witness: Yes, it does.

Mr. POLAND: I am glad to hear it, because my gas fixes.

Mr. BESLEY: It effects a saving of 40 per cent. of gas, and therefore the company object.

Alderman WHITE: Could it not be placed on any portion of the consumer's pipe?

Mr. POLAND: Yes.

Alderman WHITE: And what difference in saving would there be in that case?

Mr. POLAND: None, and if they put it on the consumer's pipe we have nothing at all to say about it.

Alderman FINNIS: What is the importance of this matter?

Mr. POLAND: Only that if it is allowed in one case they will do it all through the district.

Alderman WHITE: Is it a fact that the gas company are responsible for any accident that may arise?

Mr. POLAND: Yes, if it arises from any defect in the meter, or the outlet or inlet pipes.

Mr. BESLEY: But they can go every hour in the day to inspect.

Mr. POLAND: And then, if the meter wants changing, instead of having simply to unscrew the joint, it takes the men a much longer time to do the work. In this case, the defendant does not say it was an inadvertence—that would be a different matter—but he claims to put his regulator here as a right.

Mr. BESLEY: What is to prevent the company claiming the right to supply the whole of the outlet-pipe instead of this small length? and then we could not put on a regulator at all. The Act of Parliament gives them no control beyond the meter, and yet we are brought here, on a criminal charge, because we claim this as a right.

Mr. POLAND: We do not give the outlet-pipe to the consumer, and we only put this pipe there to give us the power to protect our meter.

Mr. BESLEY: Yours is the only company who do it. And if you give one foot, why not ten feet. I say you have no wrong to complain of.

Mr. POLAND: Excuse me, we have. If you will say that for the future you will put your regulator on the consumer's pipe——

Mr. BESLEY: We say it is the consumer's pipe.

Mr. *H. Smith*, examined by Mr. POLAND.

I am a member of the firm of Smith Brothers, and wrote the letter referred to, addressed to Mr. Duckham. [Copy of letter produced and read. It stated that the company objected to the regulator being placed so close to the meter, and that under those circumstances Messrs. Smith would not have any further alteration or disturbance of the pipes on their premises till the dispute was settled between Mr. Duckham and the company.]

Cross-examined by Mr. BESLEY: I did not tell Mr. Docking whose pipe it was on the other side of the meter. He only superintended the work as a gas engineer. The person with whom we made the contract was Mr. Duckham, and he is the person who offers to keep the regulators in repair for three years. I did not tell him this was the gas company's pipe.

Mr. BESLEY: Probably you did not know it.

Re-examined by Mr. POLAND: We did not inform the gas company previously that we were going to have regulators put in. Two of them are placed under the counter where the meters are. They were placed there for convenience.

Mr. BESLEY: Then that is the most convenient place in which they can be placed?

Witness: They were placed there for our convenience.

By Mr. POLAND: I never saw Mr. Duckham. I knew Mr. Docking as the superintendent of the work. He was the person who called after my letter was written, and he brought the workman there.

Mr. *J. Johnson*, examined by Mr. POLAND.

I am the chief inspector of the Gaslight and Coke Company. Our company charge nothing in the City of London for the use of their meters. We supply them with inlet and outlet pipes attached. Our property ends with the brass union on the outlet. We consider it essential to have the outlet-pipe, so that if we have to take away the meter at any time we can do it by simply disconnecting the union which we go to the expense of putting there, and can use the material again for fixing another meter. We never fix a meter without such a pipe. The first meter the company ever fixed had an outlet-pipe attached, and so has every meter we have supplied for the last 50 years. We do not object to the use of regulators by the consumers—indeed, we sometimes fix them ourselves; but we insist that they shall be placed in a position so as not to interfere with our property. In the present case we could not remove our meter without interfering with the regulator. We have been called upon repeatedly to replace regulators where they have been fixed directly on the outlet, when we have been compelled, from some cause or other, to remove the meter. We have made no change whatever in the mode of fixing our meters, because of these regulators coming into use.

Mr. POLAND: I understand you have no objection to these regulators if properly fixed?

Witness: None whatever. I have frequently advised consumers to get a regulator; and I could name instances in which I have fixed them at the desire of the consumer.

Mr. POLAND: So that your outlet-pipe is preserved from interference, you do not object?

Witness: No; we have had frequent accidents from the use of regulators. We had one three weeks ago at the County Bank; it was a mercurial regulator, and the mercury got spilled. We only interfere for our own protection; and whether the regulator is good or bad, we do not object. We object to having our property taken away, which has perhaps cost us 2s. or 3s.

Cross-examined by Mr. BESLEY: The value of the piece taken away in this case is perhaps 2s. The union is not taken away, but is appropriated for the purpose of fixing the regulator. I went to Messrs. Smith's premises, and saw where the regulators are placed under the counter, the inspector having called my attention to it. They were placed there, I understood, for Mr. Duckham's convenience. I have heard for the first time to-day that it was for Messrs. Smith's convenience.

Mr. BESLEY: What you complain of is, that it entails a little more labour in removing the meter?

Witness: No; I do not care about the labour; but I complain that the property of the company has been removed, and that obstructions have been put in the way of the company having free and proper access to the outlet of the meter, if it should become necessary to remove it.

Cross-examination continued: I cannot say for how long the meter has been at Messrs. Smith's. There have been meters of ours there for 20 years. I cannot say whether once in five years we have had to remove one of them. I know that other companies do supply outlet-pipes to their meters. We do not charge the consumer for the use of the outlet-pipe nor the union; we never go beyond that. Sometimes the union may be 2 feet, sometimes 2 feet 6 inches from the meter; sometimes 18 inches. I have never recommended this particular regulator; if I did recommend one it should be a good one. So long as this one is sound it does regulate the supply of gas.

Mr. *Thomas Tully*, examined by Mr. POLAND.

I am the superintendent of the London Gas Company. We supply meters to our consumers with inlet and outlet pipes attached. We retain our property in these pipes, and the control over them, making a charge for maintenance. In my judgment it is essential, for the proper carrying on of the business of the company, that they should have control over the outlet up to the union joint.

Mr. BESLEY: We could not expect Mr. Tully to say anything else.

Alderman WHITE (to Mr. Johnson): Did you say that you have had instances in which you have placed a regulator upon the consumer's pipe.

Mr. JOHNSON: Yes.

Alderman WHITE: At the request of the company?

Mr. JOHNSON: No; the consumer has wished to have a regulator, and we have provided it for him.

Alderman WHITE: The consumer paying for the regulator, and the company directing where it should be placed?

Mr. JOHNSON: Yes.

Alderman WHITE: Do you know of instances in which regulators have been placed upon consumer's pipes without the consent of the company?

Mr. JOHNSON: Yes, a great many instances; and we have never raised an objection.

Mr. *Tully*, cross-examined by Mr. BESLEY.

I know Duckham's regulator. It is put upon our pipes in some cases, and we raise serious objections to it.

Mr. BESLEY: You never take any proceedings in the matter?

Witness: We intend to do so.

Mr. BESLEY: As soon as this company have succeeded?

Witness: Yes; either here or elsewhere. We object to them on the ground of the position in which they are placed, and not because they save the gas. I tested one yesterday——

Mr. BESLEY: I do not ask you for this, so do not put it upon me.

Witness: When I find there is a leakage, with a pressure of 5-10ths, of 72 per cent.——

Mr. BESLEY: They waste gas! Can they leak without there being a smell?

Witness: No; but unfortunately it is discovered too late.

Alderman WHITE: The gas which leaks has passed through your meter?

Witness: Yes.

Alderman WHITE: So that it is no loss to the company.

Mr. POLAND: But the company may be liable for an explosion.

Witness: Yes.

Mr. POLAND: I shall not call any other witnesses to establish the custom of supplying outlet-pipes.

Mr. BESLEY: If the bench think it necessary that I should answer this case, I shall have to ask for an adjournment, as Mr. Duckham is in Yorkshire.

Alderman WHITE: This case involves some very important principles. It involves the principle of protection to the gas company, and it involves the principle of how far a consumer may be liable for what he does in a matter of this sort. That being so, I think it wise that an adjournment should take place, not only for the convenience of counsel, but that I may have a little time to confer with Mr. Martin, the chief clerk of the court.

After some conversation, the further hearing was adjourned to the 31st inst.

MONDAY, JULY 31.

The further hearing of the case was resumed this morning before Alderman WHITE.

Mr. BESLEY, who appeared for the defendant, contended that, even admitting, which he was not prepared to do, that the defendant was responsible for the work done at Messrs. Smith's premises in fixing the regulators in question, there had been no unlawful and wilful damage of the property of the complainants within the meaning of the statute. Assuming that Mr. Poland could by any ingenious argument prove the work to have been done under the directions of the defendant, he should contend that the provisions of the Gas-Works Clauses Act could not be extended to companies established and incorporated before the year 1847. Then, again, he would call attention to the words of the 19th section of the Act. They were as follows:—"Every person who shall wilfully remove, destroy, or damage any pipe, pillar, post, plug, lamp, or other work of the undertakers for supplying gas, &c., shall for each such offence forfeit to the undertakers any sum not exceeding £5, in addition to the amount of damage done." Now the pipe alleged to have been damaged by the defendant was not a pipe for the "supply" of gas by the company, it was a pipe for the conveyance of gas after it had been supplied to the consumer. All the pipes up to the meter were pipes for the supply of gas—all beyond were pipes for the conveyance of gas to the burners. But supposing the bench was of a contrary opinion, he would submit that in a case of this kind, where the defendant was summoned under a criminal section of an Act of Parliament, his worship must be guided by the principle which governed all justices in summary convictions, and, looking at the evidence, see whether the alleged offence was brought home to the defendant. What had he done? It would be shown in evidence that Mr. Docking never saw the pipes before the regulators were fixed, nor did he interfere with the work in any way. Mr. Smith, the consumer, gave directions that the regulators should be put up on his premises. He did not tell the workpeople that the piece of pipe beyond the meters had been put up by the company, and it could not be said for a moment that the workpeople employed for the purpose of fixing the regulators were bound to know that the company had adopted so unusual a practice. There was no notice on the pipe to say that it belonged to them, and that it must not be interfered with. If the company chose to do so, and had a wish to stop the use of these regulators, there was nothing to prevent them from making their outlet-pipe so long as to render it impossible to put one up; and indeed he would show, from plans that had been carefully prepared, that, unless the regulators were fixed in their present position, they could not be employed at all by Messrs. Smith, the space between the meters and the wall not admitting of their being fixed elsewhere. To be of any service, the regulator must be put on between the meter and the first burner, and this in Messrs. Smith's case could only otherwise be done by putting it in the shop-window. It was alleged on the last occasion, as an objection to the position in which the regulators were fixed, that it necessitated a large amount of labour on the part of the gas company's servants whenever a meter had to be removed, but he (Mr. Poland) was prepared with evidence to show that in 14 minutes the whole of the three meters could be taken away and replaced exactly as before; so that it was absurd to talk of the company suffering any injury in this respect. Then it was stated that the pipe of the company had been wilfully removed. As a matter of fact two inches had been taken away, and whenever Messrs. Smith were dissatisfied (as they were not likely to be while they saved 40 per cent. of their gas), Mr. Duckham was bound to replace the pipes as they were. In truth, there was no ground for these allegations, and it was nothing but an underhanded attempt on the part of the company to prevent the consumer using a regulator, by which he was protected from paying for more gas then he actually consumed. The invention was one which ensured a uniform pressure at all the consumer's lights, and stopped the waste of gas through its escape in an unburned state. As to the point of law, there was one case only to which he would call attention as being germane to the subject of malicious injury to property, and to show that before a person could be convicted of any such offence, it must be proved to have been knowingly, wilfully, and designedly done. In *Regina v. James* (8 C and E), quoted in the second volume of "Russel on Crimes," the defendant was a person who had charge of some mines, and there being a dispute between two adjoining colliery owners, one of them caused a wall to be put up which stopped the ventilation of the other pit, and so exposed the miners to the danger of suffocation. It was there held that if the master told his man James to build the wall, and the man believed that his master had a reasonable right to build it, he was not guilty of a crime. Now, in the present instance, the defendant might have been guilty of a trespass, and when the case first came into court it was almost conceded that the offence—if there was an offence—was nothing else, and the matter was adjourned with the view of ascertaining whether any facilities could be given for trying the question in a civil court; but, instead of doing that, the company took upon themselves to strain the law for the purpose of obtaining a criminal conviction against the defendant, which, on the strength of the case just quoted, he (Mr. Besley) submitted could not be sustained. There was one other case to which he might allude—the case of *Hearn v. Garden and Stone* (28 *Law Journal*, M.C., 216). The offence alleged there was that the defendants, who were carriers, sent by the Bristol and Exeter Railway certain dangerous goods, and it was held that they were not criminally liable, unless they knew at the time that the goods so sent were dangerous.

Mr. POLAND said he did not see what this had to do with the present case.

Mr. BESLEY said he quoted it to show that there must be a guilty knowledge on the part of the defendant to ensure a conviction. In the present case the plaintiffs must show that Mr. Docking was aware the pipe on the outlet of the meter was the property of the company, before he could be convicted of wilful damage. Under all the circumstances, he trusted the worthy alderman would feel it his duty to dismiss the summons, and to mark his disapproval of the course taken by the company by giving the defendant his costs.

Mr. POLAND said his learned friend contended that the Gas-Works Clauses Act did not apply to The Gaslight and Coke Company, because it was previously incorporated. In reply he would state that by the company's Act of 1868 the Gas-Works Clauses Act was expressly incorporated.

Mr. BESLEY: Does my friend mean to say that in the Act of 1868 there is no provision with reference to tampering with meters?

Mr. POLAND: I am told not.

Mr. BESLEY: The Act of 1847 was expressly intended to apply to companies established thereafter, and the 68th section of the company's Act provides for this very question.

Mr. POLAND: It does not vary the clause in the General Act.

Mr. *W. S. Mathews*, examined by Mr. BESLEY.

I am a mechanical draughtsman, and agent for Mr. Duckham. The drawings produced were prepared by me. They show the position of the three meters and regulators at Messrs. Smith's premises. In one case, the meter is about 6½ inches from the wall. The width of the regulator at its widest part is 10 inches, so that it was physically impossible to put it at that side. The distance of the meter from the wall on the inlet side is about three-quarters of an inch, so that it could not be shifted further that way. There is no place to put a regulator underneath the counter except where it has been placed. Whether it could be placed in the room above I do not know, nor whether that room belongs to Messrs. Smith. In the second case, there is rather less than 2 inches of space on the outlet side between the meter and the storey post of the house, and the regulator could not possibly have been placed otherwise than where it is. In the third instance, the space between the outlet of the meter and the wall is about 8 inches clear. In every instance the regulator has been fixed in the most convenient position. I am acquainted with these regulators, and know that by their use a large saving of gas is effected, and leakage from the fittings is reduced if they are defective.

Cross-examined by Mr. POLAND: I could not tell when I examined the place to whom the pipe on which the regulators are fixed belongs. I did not know that the gas company supply outlet-pipes with their meters. I am not able to say that in the first case the regulator could not be placed on any part of the consumer's pipes. In the second case, it could not be done according to the custom of fixing them for 15 years. I do not think I can answer the question in any other way, It would be an absurdity to put it on the consumer s pipe in the way suggested, and it would be a most unworkmanlike piece of business. In the third instance, the regulator could not be placed in a better position than it is. So far as I am acquainted with the premises, it could not be put upon the consumer's pipe so as to act as a regulator. I will not undertake to swear that there is not room for it. I know Mr. Docking. He is in the service of Mr. Duckham as one of his London agents. There are several others; I am one. As such I should cut the pipe on the outlet side of the meter to put on a regulator if the consumer ordered it. I consider that is the consumer's pipe. If there were any leakage afterwards we should be responsible, as we guarantee our work for three years.

Re-examined by Mr. BESLEY: Mr. Docking has nothing whatever to do with fitting up the regulators. He merely superintends the way in which the work is finished off. He goes with Mr. Duckham's foreman to see that there is no leakage after the work is done. He has nothing to do with determining the place where the regulator shall be fixed. He may make a suggestion, but the matter is left more in the mechanic's hands.

Mr. *James Hyde*, examined by Mr. BESLEY.

I am a gas-fitter, and was employed to fix three of Duckham's regulators on Messrs. Smith's premises. There was no selection of the place where they were to be inserted. Custom always directs us to the place. When I went I found a new meter and new fittings had been put up. I supposed the outlet-pipe belonged to Mr. Smith, and cut it with a saw, to introduce the regulator. I cannot say whether I took off any part of the pipe. I frequently put up regulators without doing it. If I did take off any it was not more than four inches. Mr. Docking had nothing whatever to do in pointing out the place for fixing the regulators. I received them from a Mr. Bristow. Mr. Docking is expected, after the work is done, to inspect it. I believe he called while I was doing the work, but he gave me no directions about it.

Cross-examined by Mr. POLAND: Mr. Bristow is the manufacturer of regulators for Mr. Duckham. I do not know in what relation they stand to each other. I receive no orders except from Bristow. His place of business is 90, Pratt Street, which is also Mr. Duckham's advertised address. I did not know that the outlet-pipe of the meter up to the brass union was the property of the company. To have a pipe belonging to the company on that side of the meter was quite new to us. It is not the custom of the companies, when they supply meters, to supply them with outlet-pipes attached. They always supply inlet-pipes. I do not know what length of pipe there is in either of the three cases between the union joint and the first burner. It may be 10 feet.

Re-examined by Mr. BESLEY: I know of no instance except the present in which a gas company supplies the outlet-pipe of the meter. It is always considered the consumer's pipe. The largest and richest company in London—the Imperial—neither supply inlet nor outlet pipe, nor do they fix meters. They let out meters on hire.

Mr. *N. Bristow*, examined by Mr. BESLEY.

I am a gas-fitter, and the maker of these regulators. I have carried on business in Pratt Street five or six years. Mr. Duckham has an office on the premises. I manufacture regulators for him. I gave directions to the last witness to put them up at Messrs. Smith's. Mr. Docking had nothing to do with reference to the place where they were fixed. After they are fixed he has the entire control of them. It is not true that it would take a day to remove a meter where a regulator is fixed close to it. I could do it in less than five minutes. There is no inconvenience whatever to the company. In the case of the first meter we actually increased the length of outlet-pipe by adding from 6 to 9 inches; in the second, there might be 2 inches removed; and in the third case, with the alterations we made of connexions, the pipe has been lengthened about 3 feet.

Cross-examined by Mr. POLAND: Mr. Duckham gave me the orders to fix the regulators at Messrs. Smith's; Mr. Docking had nothing whatever to do with it.

The CHIEF CLERK: Then it would seem you have got the wrong defendant.

Cross-examination continued: I contract to make the regulators at so much a piece for Mr. Duckham. I do not contract for fixing them, but it is done by persons in my employ. I am paid for it by Mr. Duckham, and employ the workmen; I have nothing to do with the customers. All my arrangements are with Mr. Duckham. I undertake to swear that in each of the cases in question the

regulator could not have been fixed beyond the union joint without inconvenience and additional expense.

Re-examined by Mr. BESLEY: The regulator would be of very little use if it were removed to a great distance. It is more convenient to have it near the meter. There is not the slightest doubt that the place where these are fixed is the proper place. No gas-fitter with any sense would put them elsewhere.

Mr. BESLEY produced a card, a copy of which he said was supplied to every consumer in The Gaslight and Coke Company's district, containing their regulations for the supply of gas. It stated that "the service-pipe outside the premises is laid on and kept in repair by the company, whose property it is. A meter-rent is charged if the meter is found by the company, but consumers are at liberty to find their own meters. No meter is to be disconnected unless the company's permission has first been obtained. The inspector to be allowed, at all reasonable hours, free access to any premises where the meter is situated." There was not, he said, one word in these regulations to show that the company claimed any property in the outlet-pipe.

Mr. *H. A. F. Duckham*, examined by Mr. BESLEY.

I am the patentee of these regulators. They secure combustion of gas at any pressure above 3-10ths, and perfect combustion at 5-10ths pressure. I have supplied a large quantity of them.

Mr. POLAND: We do not want to advertise the invention here.

Mr. BESLEY: Do they save the consumer a large quantity of gas?

Mr. POLAND: Of course; that is the inducement to purchase them. I must ask my friend to go on with his evidence. It is not material now whether these regulators effect a saving or not.

Witness: It is very large in some cases. I have one here in which the saving is £60 per annum.

Mr. POLAND: That is not material.

Mr. BESLEY: It is material, as showing the motive of the prosecution. Without the regulators, the company get paid for wasted gas. By this invention they only get paid for what the consumer burns.

Witness: Certainly.

Mr. BESLEY: Are the statements in your circular correct, that you have supplied regulators to the persons and companies mentioned?

Witness: The whole of them.

Mr. BESLEY: Has this been going on from 1857 or 1859, and is this the first summons taken out by any gas company against you?

Witness: Yes.

Mr. BESLEY: This is the first time an attempt has been made to prevent your invention being used?

Witness: Yes.

Mr. POLAND: I must correct Mr. Besley. There is no attempt to prevent it. All we say is, put it on your own pipe, not on ours.

Mr. BESLEY: We don't want your pipe—take it away.

Examination continued: Mr. Docking has nothing to do with the regulators till they are fixed, except to take orders for them. He received the money from Messrs. Smith to pay to me. I give Bristow directions to do the work. There is nothing exceptional in the way it is done. There is no other place where the regulators could conveniently and safely be fixed. I never knew till now that the gas company had taken upon themselves to supply outlet-pipes in connexion with their meters. Whatever responsibility might be incurred for the work done by me, I am prepared to meet in the proper place.

The CHIEF CLERK: The only question is whether the right person is summoned here.

Cross-examined by Mr. POLAND: When I am away from town, Mr. Taylor attends to my business. It is not the duty of Mr. Docking to superintend the work done. He examines it afterwards, and reports to me.

Mr. BESLEY proposed to call another witness, but

The CHIEF CLERK said it would be better first to settle the question whether the right person had been summoned.

Mr. POLAND said, if it were not so, the company would take out a fresh summons. They had great difficulty in getting at the persons who actually did the damage. Docking was the person who took the order; he was present while the work was done, and he was the person who went to the premises again when complaint was made.

The ALDERMAN (having consulted with the chief clerk for a few minutes) asked if Mr. Poland could carry the matter further.

Mr. POLAND said he could not. If the magistrate decided that the company had summoned the wrong person, they must take out a fresh summons, and go over the whole evidence again.

The CHIEF CLERK said perhaps Mr. Besley, to save expense, would agree to substitute another name.

Mr. BESLEY said he should not agree to do so, for this reason, that while they were discussing a question of trespass and an action at law, the company turned round and insisted that the defendant had committed a crime, and sought to get him fined.

Alderman WHITE: I have no alternative, then, but must dismiss this summons. There is no evidence in support of the charge against the defendant.

Mr. POLAND: You dismiss it on the ground that Docking is not responsible.

Alderman WHITE: Yes.

Mr. BESLEY: I must ask for costs.

Alderman WHITE: No; each party must pay his own costs.

LANCASTER ASSIZES.—SATURDAY, JULY 22.

(*Before Baron* MARTIN.)

BOOTHMAN *v.* THE MAYOR AND CORPORATION OF BURNLEY.

This was an action to recover damages for injuries sustained by reason of an explosion of gas arising from the alleged negligence of the defendants.

Mr. POPE, Q.C., and Mr. LERESCHE appeared for the plaintiff; and Mr. HOLKER, Q.C., and Mr. CROMPTON for the defendants.

It appeared that on the 31st of December last there was an explosion of gas beneath the plaintiff's shop. The plaintiff is a provision dealer, and by the explosion the shop window was blown out, the stock damaged, and the plaintiff's wife and niece severely injured. The plaintiff himself was a working operative, his wife managing the shop. It appeared that there was a leakage of gas in some old pipes laid down some twelve years ago, and the gas had percolated through the soil under the floor of the shop, and had then got into the shop through the chinks in the floor. The corporation on the 25th of December had been made acquainted with the fact of the escape of gas, and had sent a man to look at the place, who said there was no danger. The plaintiff's wife again complained to the corporation on the 27th of December, and they sent two men down to the shop, who inserted an escape-tube into the soil, but it did not answer, and on the 31st of December the explosion occurred.

The jury found a verdict for the plaintiff as to the defendants liability; the amount of damages was referred.

ARMAGH ASSIZES.

(*Before the Hon. Justice* O'BRIEN, *and a Special Jury.*)

COCHRAN *v.* LUTTON.

The facts of this case, which was a claim for compensation, were as follows:—In the month of July, 1870, the Lurgan Town Commissioners opened a portion of the town called Edward Street, for the purpose of putting down new sewage-pipes. On the night of the 9th of October, 1870, where this sewer ends, the plaintiff was thrown from his gig, and sustained considerable personal injuries, and accordingly sued the Town Commissioners, in the person of Thomas Lutton, town-clerk, for £1000, alleging that defendants did not take proper means to fill up the said opening. The counsel for defendants quoted the case of *Hyams v. Webster*, wherein it was set forth that, "if any corporate body open the ground for necessary purposes, and use suitable and proper means to close the same, if any misfortune afterwards happens, they are not to be held accountable." The judge bowed to this decision, and also referred to it in charging the jury. The case was heard at great length, but the jury did not agree to a verdict.

Miscellaneous News.

EUROPEAN GAS COMPANY, LIMITED.

The Half-Yearly General Meeting of the Proprietors of this Company was held at the Offices of the Company, 11, Austin Friars, on Wednesday, July 19—W. WHITE, Esq., in the chair.

The SECRETARY (Mr. H. M'Lauchlan Backler) read the notice convening the meeting, and the following report of the directors:—

The report presented to the half-yearly general meeting, held in February, entered at such length into the effects of the war on the financial position of the company, as to prepare the shareholders for an inevitable diminution of profit.

Amiens.—The reduction of profit would have proved much larger, if considerable advantage had not been derived from sales of coals owing to the vigilance of the superintendent, who, with the approval and co-operation of the authorities, availed himself of the opportunities that occurred to dispose of a portion of the stock your directors had accumulated in prevision of a stoppage of the usual means of supply. Notwithstanding that this city is still occupied by the Germans, business has been generally resumed, and is daily becoming more active. The shops, however, are closed early, and private gas consumers have not yet quite returned to the rate of lighting which had become customary previous to the war; but this your directors confidently believe will be the case again shortly, and it has become indispensable to proceed with the new gasholder, the necessity for which (partly to replace an old one) was announced last year. A contract for the immediate execution of this important work is now under consideration.

Boulogne-sur-Mer.—The hotels and lodgings of this town were well tenanted during the whole of the winter, principally by refugees from the invaded parts of the country, but as all places of amusement were kept strictly closed, the gas-rental fell off considerably. It is now recovering fast, and unless seriously interrupted by the effect of recent stringent regulations with regard to passports, in checking the influx of English visitors, will soon exceed the amount realized previous to the war.

The long-pending question of a revision of the concession, under which this company might have been compelled to remove their works to the exterior of the town, has at length been finally settled, and your directors have the satisfaction to report that they have secured the right to continue their operations on the present site, in consideration of certain advantages granted to the municipality, coupled with an undertaking to partially modify the arrangement of the works immediately, and to enclose them with ornamental walls and buildings. These alterations are now in progress.

Caen.—This city barely escaped occupation by the Germans, who had arrived in the vicinity when the armistice took place. A feeling of depression had been produced in anticipation of this unfavourable state of affairs, and the influence on business was almost as disastrous as if the event had actually occurred. Some improvement has been perceptible of late, but it is less rapid than that which has been mentioned under the head of Boulogne.

Havre and Ste. Adresse.—At one moment the bombardment of this town appeared imminent, the Germans having completed their preparations with that object, when, fortunately, the impending calamity was averted by the arrangement of bases for peace.

In the early part of the war the port was overcrowded with shipping to an extent that rendered the discharge of vessels there exceedingly difficult for all purposes except those of the Government. It appeared prudent, however, to guard against contingencies by providing a full stock of coals, although both steamers and sailing vessels were then much in demand. Consequently high freights became unavoidable, and the additional cost of coals for the year at this station has exceeded £1000, which, together with a large reduction of rental, has had a most prejudicial effect on the financial results.

This season of misfortune is, however, passing away, and business is already assuming a healthy aspect. It may, therefore, be expected that prosperity will soon again prevail here.

An opportunity having occurred, during the distress caused by political events, to purchase a piece of land, with buildings thereon, contiguous to the gas-works, your directors secured the property on terms exceedingly favourable to the company; it will prove of great value for extensions at a future period.

Nantes and Suburban Districts.—This station has suffered but slightly, and only from the temporary discontinuance of performances at the theatres. Had not the cost of coal been £570 in excess of the previous year, the amount of profit would have been greater than that then made.

Rouen, Sotteville, and Suburban Districts.—The factory owners, who are most important customers at this station, having been compelled, in consequence of the Prussian occupation, to keep their establishments closed during the whole of the winter, very little gas was consumed other than that required for the public lights, which are not remunerative. Hence the large reduction of profit, without any counterbalancing advantage from sale of coals, the town having been sufficiently supplied with fuel up to the moment when six British ships, of which one had just delivered a cargo for this company, were seized and sunk in the Seine, by order of a Prussian officer.

Summary.—Although the reduction of profit is exceedingly heavy, there is fair ground for congratulation in the fact that, amidst the ruinous destruction of the past twelve months, this company's property has not received any damage, the works being all in good condition, and prepared to supply the additional demand for gas which may be expected shortly to arise. At the same time it is evident that all establishments in France will be subject to increased taxation; but, on the other hand, such operations as suffered from the excited state of the country, and frequent calls on the time of *employés* and workmen for service in the National Guard, may, in future, be conducted with greater regularity and economy than was possible under circumstances of unprecedented difficulty.

Your directors recommend the payment of a dividend at the rate of 8 per cent. per annum, together with a bonus of 1 per cent. After providing for this, a balance of £1035 3s. 2d. will remain, to be added to the reserve of undivided profits.

Notice has been given that two of your directors (John Fisher, Esq., and Lewis Cubitt, Esq.), and both auditors (William Jones Lewis, Esq., and George Harrison, Esq.) retire from office at this meeting, but, being eligible, will be proposed for re-election.

The CHAIRMAN: Gentlemen, as you will have heard from the report, you will not receive this half year so large a dividend as you have been in the habit of receiving for the last two years. The directors very much regret the fact, which arises from circumstances over which they could not possibly exercise any control. Our business has not realized the profits which, when we last met you, we expected it would do, because, as you all know, we have had immense difficulties to contend with—difficulties which we not only could not foresee, but were powerless to overcome. In fact, we had two of our stations in possession of the Germans, and two others on the point of being so occupied. Our position was not only unenviable but very dangerous, and I assure you that we, as your directors, have had anything but an easy time of it during the past twelve months. On the contrary, it has been a time of great anxiety for us, and we feel now, as we look back upon the events of the year, that to have emerged as we have unscathed, without the loss of property, and with only a temporary reduction in our business, is really a most fortunate circumstance for the company. We should have preferred to pay you the same dividend to-day that we did last year, but the earnings of the company will not admit of it, and as there is some degree of uncertainty as to the rapidity with which we shall resume our former prosperity, we think it only right, as prudent men, to keep within the bounds of the profits earned in the past twelve months. While upon this subject you will, perhaps, allow me to say that upon the recent visit of myself and the secretary to our several stations we were agreeably impressed on findnig that the accounts had been so well paid, and that we have really made scarcely any bad debts during the serious crisis through which affairs in France have just passed. I hope and expect that when we meet you again this time next year we shall be in a position to lay before you a far more favourable statement of the business of the company than we are able to do to-day. You will have observed by the report that we have been under the necessity of enter-

ing upon some heavy works, of which the principal is the gasholder at Amiens. This has been a long time under consideration, and we have deferred it till as late a period as we dared venture to do so. We feel now that the interests of the company would have been jeopardized if we had hesitated any longer. At Boulogne also, as you are informed, after long and tedious negotiations—negotiations extending over several years, during which we have had to deal with several *maires*, who have succeeded each other—we have obtained permission to retain our works in their present position, though this necessitates, I might almost say, the entire transformation of those works. But this, gentlemen, is the price we have to pay for being allowed still to occupy the present site of our works. It is hardly necessary to tell you that, if we had been unsuccessful in our negotiations, we should have had to incur a very large outlay, which could not be estimated at less than £20,000, while we should have suffered the expense and inconvenience of having our works at a distance from the town, accompanied with the want of facilities for the conveyance of coal and coke and other produce. I think, therefore, we may congratulate ourselves that we have made a good arrangement at Boulogne, and that we have surmounted the very serious difficulties which our failure there would have involved. You, no doubt, remarked also the statement in the report that we have purchased another piece of land at Havre. This is in pursuance of the policy which your directors always adopt, that of looking forward to the future, and instead of living, as it were, from hand to mouth, of making provision for the expected necessities of years to come. This land, which has now cost us about £3000, would most probably have cost us double that amount if we had waited until its acquisition became indispensable to us, and that want had become known to its proprietors. We always find, when we really want land, that we have to pay something like double the price we should do if we were able to forestall our wants, and take advantage of favourable circumstances to obtain it. I have only to add that there is every prospect of the parts of France in which our works are situated being speedily evacuated by the Germans, and, as their presence weighs heavily on the energies of the people, it will be a happy event for them, and a fortunate one for us, inasmuch as, when local industry is free, trade, in all its branches, will be developed, and we shall derive the benefit in an increased consumption of gas. It would be a repetition to say that, under all the changes which have taken place, we have kept, as we always attempt to do, in the strictest good relations with all the authorities. We have had many to deal with, and we have kept, as I said before, on excellent terms with them all. It has been our continual policy not only to satisfy the authorities, but all our customers, on every occasion, and to maintain that goodwill which in former times always distinguished our dealings with the public at our various stations. I need not, I am sure, say anything to satisfy you that we shall persevere in the same course, and I will only add the expression of my hope that the same happy results that have attended us in the past may accompany us in the future. Thus, gentlemen, I have ventured to offer you a few words upon the report which has been read; and in now moving—"That the report be received and adopted," I will only say that I shall be happy to hear and answer any questions which the shareholders may think it necessary to put, and to give every information in my power respecting the affairs of the company.

Mr. FAWCETT seconded the motion.

Mr. STOKES: We must all feel very much pleased that our affairs have been going on so satisfactorily. Our dividend on this occasion is not so large as it has been, but we were all prepared for that, and indeed we expected it would have been less. Seeing, however, that we are to receive 5 per cent. for the half year, we cannot be otherwise than thankful, and are bound to congratulate the directors that they have managed the business of the company with such judgment and success.

Mr. KITCHIN asked how the money required for the gasholder at Amiens and the land at Boulogne would be raised, and suggested that it should be furnished by a call upon the new shares.

The CHAIRMAN said at present the directors were in this position, that they did not require the money, and they had not as yet determined whether they should make a call or not. His own opinion was, that if they could raise the money by debentures at 5 per cent., as they were doing, it would be better than calling up money on shares.

Mr. KITCHIN said the company had already £90,000 of debentures, which was a large amount in proportion to the £300,000 of share capital. As a holder of new shares, he should be glad to have a call made upon his shares, and he thought that those who were similarly situated had a right to expect this at the hands of the directors. If, as a contingency of the war, the property in France of the company had been swept away, the new shareholders would have been called upon to pay off the bondholders, and their shares would have been worth nothing at all, while the original shareholders would have had all the benefit. It was, he submitted, time that the new shareholders participated more in the prosperity of the company, and he ventured to make the remark—at the same time he expressed the gratification he felt—that, notwithstanding the frightful war which had been raging, with the great risk the company had run of sustaining damage in consequence, and notwithstanding the decrease in the consumption of gas, and the great increase in the cost of coals at many of the stations, the directors, by their excellent management, were able to show so large an amount of prosperity, and to pay a dividend only 1 per cent. less than on the last occasion.

Mr. TENDRON begged to express his full concurrence in the remarks made by the last speaker. The directors were trustees for the new, as well as for the old shareholders, and as the security of the debenture-holders must rest upon the former, it was only fair that they should have a chance of reaping some advantage when it became necessary to raise money to meet the additional expenditure upon the works. He felt thoroughly satisfied with the way in which the affairs of the company were conducted, but he desired to impress upon the directors that they would act wisely, and strengthen the position of affairs, by not having too large a floating debt.

Mr. CROWDEN asked for an explanation of the excess of working capital at the Nantes station.

The SECRETARY said it was owing to the large stock of coal which during the war it was necessary to accumulate there.

The CHAIRMAN said Mr. Kitchin had spoken about making a call, and had asserted that if anything had happened so that the property of the company in France had been swept away, the new shareholders would have had to make good the amount due to the bondholders. In this matter the honourable proprietor was quite mistaken. The company had a large extent of freehold land, the value of which was quite equal to their debenture debt. The effects of the war might have been to injure their plant and works for a short time, but they had ample security for the debenture-holders, altogether apart from the calls they were able to make, and there would be no loss ultimately to the shareholders. With regard to a call, gentlemen were not aware—especially new shareholders—that those shares had received a very much larger dividend for the time that they had been created than ever the old shareholders had received at all. The latter had to bear the burden, and brunt, and heat of the day before the affairs of the company were brought into the prosperous condition they now presented, and before the new shareholders came into the concern. It was natural, of course, when the company was paying large dividends, that the new shareholders should be anxious to have their capital called up, whereas if the times were bad, and money at 10 or 12 per cent., they would not be so ready to press the matter. But what he rose to speak for was to disabuse the mind of the honourable proprietor respecting the repayment of the bondholders, and to assure him that the company had ample means, leaving alone the uncalled capital, to pay off all the debentures, whatever might happen to them.

Mr. H. SOLOMON asked whether the same amount had been passed to depreciation during the past as in former years.

The SECRETARY said it was rather larger, because it included the interest on the amount accrued since last year.

The CHAIRMAN said different amounts were written off for the redemption-fund during the year, and at the end of the year interest was added to that, so that every year it came to more than the preceding year.

Mr. TENDRON said he supposed the board had not dealt more tenderly with the redemption-fund this year on account of the state of things on the Continent.

The CHAIRMAN said at the time when the accounts were made up the directors could not tell what position France would be in, but he believed they had given the shareholders all that, as prudent men, they were justified in dividing. He was glad it was so much, and he was still more pleased to find that the shareholders at large regarded it as satisfactory.

Mr. BARBER asked the object of the depreciation and redemption fund. Was it for loss arising from expiring leaseholds, or for depreciation of works?

Mr. FAWCETT said it was for the purpose of redeeming concessions.

The CHAIRMAN said the company was in this position: they had concessions for certain terms—say 40 years. At the end of those terms they possibly might have to give up their works at a valuation, and the directors desired to be able to hold the property of the shareholders intact, whatever might happen. They were, therefore, obliged to put by something annually—perhaps they did it rather liberally; but, if so, they erred on the safe side—so as to form a redemption-fund for reinstating the capital whenever a concession ran out. Ordinary wear and tear was put to the wear and tear account, and the laying of new mains and works of that description was placed to capital, care being taken to credit that account with the value of the mains or works replaced.

Mr. BARBER asked whether the company's property was freehold.

The CHAIRMAN said all but one station, and that was held on a very long lease.

Mr. RASCH said he believed there were debentures amounting to many thousands of pounds falling due at the end of the year, and he thought it would be better for the directors to make a call upon the new shares, and pay off those bonds, rather than renew them.

The CHAIRMAN said the board had already paid off £10,000 this year without a call.

Mr. RASCH said in that case he would not press his suggestion, but he could not help thinking the company would stand better if their bond debt were less. He had a strong aversion to it.

Mr. LYSLEY asked what was the average rate of interest paid by the company on debentures.

The CHAIRMAN said 5½ per cent., but they had renewed at 5 per cent.

Mr. LYSLEY asked the price charged for gas.

The SECRETARY said it varied. The average of the six stations was 5s. 3d. per 1000 cubic feet.

The motion for the adoption of the report was put, and carried unanimously.

The CHAIRMAN moved—"That a dividend at the rate of 8 per cent. per annum be payable on the old shares, and the first moiety thereof having been paid on the 1st of February last; that the second moiety be paid on the 2nd of August, together with a bonus of 2s. per share on the old shares, and 1s. on the new shares—the whole out of interest and profits, and free of income-tax."

Mr. SOLOMON seconded the motion, which was put, and carried unanimously.

The CHAIRMAN moved the re-election of Mr. John Fisher as a director.

Mr. ROAN seconded the motion, which was put and carried.

The CHAIRMAN then moved, and Mr. BADDELEY seconded, the re-election of Mr. Lewis Cubitt as a director, which was also adopted.

On the motion of Mr. SOLOMON, seconded by Mr. STOKES, one of the retiring auditors, Mr. Lewis, was re-elected; and on the motion of Mr. BADDELEY, seconded by Mr. FREEMAN, the other auditor, Mr. George Harrison, was re-elected.

Mr. STOKES said the shareholders could not think of separating without expressing, by a cordial vote of thanks, their sense of obligation to the directors for their admirable management of the company's affairs during the critical events of the past half year. The board must have had much anxiety and labour in the fulfilment of their duties, and he was sure the shareholders generally would fully appreciate and recognize their services.

Mr. BARBER said he had great pleasure in seconding the motion.

The vote of thanks was cordially and unanimously adopted.

The CHAIRMAN: Gentlemen, I beg to say that your directors feel much pleased to receive this assurance of your approval. As the worthy shareholder who moved the vote of thanks said, we have had a very arduous task to perform since we last met you, and a considerable amount of anxiety has also fallen to our share. We have taken means to provide our different stations with an adequate supply of coal—we, perhaps, have somewhat over-provided; but that arose from our desire to be on the safe side. The result of our exertions, as I gather from what has passed at this meeting, is perfectly satisfactory to the shareholders. We thank you for again expressing your confidence in us, and hope, when we next meet you, we shall be able to lay before you a more prosperous condition of affairs.

Mr. CROWDEN thought the meeting should adopt a vote of thanks to the secretary, whose duties must have been very onerous in connexion with the events of the past six months. On the last occasion it was suggested by an honourable proprietor that a more substantial token of the approval of the shareholders should be presented to Mr. Backler for the devotion he displayed in the interests of the company by undertaking a journey to the stations in France during the progress of the terrible war then raging. He was sorry that gentleman was not present to renew his proposition that day; had he been, he (Mr. Crowden) would have had pleasure in seconding the motion. In the absence of Mr. Huggins, he would himself move—"That a douceur be presented to the secretary for the time and labour bestowed by him in visiting the stations, in addition to a vote of thanks for his services generally."

Mr. O. B. C. HARRISON, in seconding the motion, said that, bearing in mind what took place at the last meeting, he made it his business to be present this day expressly for the purpose of supporting such a proposal, which he fully expected would be submitted for adoption. He thought the shareholders were deeply indebted not only to the directors, but also to the secretary, for the very zealous, energetic, and able manner in which for so many years the affairs of the company had been managed, and such a recognition of that officer's services at the present moment, when in a financial point of view they were not doing so well as formerly, would be more graceful than if it were postponed till the shareholders obtained larger dividends. He, therefore, seconded the motion with great pleasure, only expressing a hope that, instead of a small douceur, they would give Mr. Backler something fully worth his acceptance. If it should be considered by the meeting generally that they were not competent on this occasion to give him what they would wish to give for services so meritorious, he hoped it would be fully understood that the subject would be brought forward again, when they could give effect to their intentions.

Mr. DE LA FONTAINE said he fully agreed in all that had been said respecting Mr. Backler and the eminent services he had rendered to the company, but he wished to ask whether it was not necessary that notice should be given prior to granting a sum of money to any officer of the company. He hoped Mr. Backler would understand that he, for one, would give his cordial support to the proposal if it were strictly in order, and it was from a desire that it might be so he now asked the question.

A SHAREHOLDER said he thought the matter had better rest with the board, who saw what the feeling of the meeting was in reference to it.

Mr. DE LA FONTAINE said he only asked for information, because he quite agreed in the proposition.

The CHAIRMAN thought it would be well for the meeting to let Mr. Backler speak for himself on the subject, as he could better explain than any one else the position in which he stood; but the shareholders might be assured that the directors would never be backward in doing what was necessary.

Mr. WASHINGTON SMITH suggested that it would be better to postpone the further consideration of the motion until the next meeting, which he was sure would be the more acceptable course to Mr. Backler. No harm would arise from the delay, and the shareholders could then give effect to their desires in a more legitimate manner. If the motion were now pressed, he would move an amendment, as some shareholders might afterwards object that advantage had been taken of their absence to bring the matter forward without notice.

The CHAIRMAN said he thought the wiser course would be to submit the vote of thanks to the meeting, and leave the other matter to the directors.

The vote of thanks was accordingly put, and carried unanimously.

The SECRETARY: Gentlemen, I am much obliged to you for this kind expression of your approval and confidence. I have not been able sooner to say that which, as my mouth is now open, I will say at once—viz., that I consider it is the duty of every man who undertakes a position, to carry out its obligations in every possible way, and that he has no business to look for additional remuneration for any special services he may be called upon to render, or any additional risks and duties which may fall to his lot. I can truly say, for my own part, that I would not for any sum of money incur the dangers to which I have willingly exposed myself during the past year, from a sense of duty. No amount of money would afford me the slightest satisfaction for having done so, and therefore, though I am extremely thankful for your kindness, I could not possibly accept the gift or donation proposed to be voted to me, either now or at any future time, for the extra services I have rendered. One very cogent reason for my declining to do so is this, that it rests with me in a great measure to recommend certain courses to the board, as secretary of the company, and I have always recommended that those officers who do their duty well should be well paid, but that they should not receive additional remuneration for every additional service rendered. I should stultify myself if I accepted anything at your hands for extra duties I may have been called on to fulfil, and therefore I could not do it consistently with my own self-respect. At the same time, I am greatly obliged to those gentlemen who have spoken so kindly of me, and to those who would be prepared to support the proposal for giving me a substantial mark of your approbation.

Mr. DE LA FONTAINE said he was prepared to hear Mr. Backler make such a statement. He would only say that if the shareholders amongst themselves would agree to present the secretary with a testimonial of their approval, he would willingly subscribe towards it, because he felt it was thoroughly well deserved. He did not care how it was done, so that it was done, and he thought they must not listen to Mr. Backler's objection respecting it.

The SECRETARY: Gentlemen, I can only repeat, that under no circumstances will I accept a gift of money for any special services I may have rendered during the past year.

The proceedings then terminated.

METROPOLIS WATER SUPPLY.

METROPOLITAN BOARD OF WORKS.

At the Meeting of the Board, on Friday, July 21—Colonel HOGG presiding,

The report of the parliamentary committee contained, amongst other items the following paragraph in reference to this bill, now before the House of Commons:—

"Your committee reported on Friday last the proceedings of the select committee of the House on the Metropolis Water Bill. They stated that the board was to be the metropolitan authority to control the water companies, but that the committee had reserved the point as to whether the control as regards the City of London should not be vested in the corporation. They have since decided that the corporation shall be the authority within the City, and that the costs incidental to the passing of the Act shall be borne by the board and the corporation in such proportion as the Board of Trade shall direct. The committee also decided to insert the clauses requiring the board to provide hydrants instead of fire-plugs. Altogether the bill has seen so much alteration that it is impossible to obtain a clear view of the whole of the provisions as it now stands until the bill shall have been reprinted, when your committee propose to meet and consider the course which it may be advisable for the board to take."

On the motion of the CHAIRMAN of the committee, the report was approved of, and ordered to be entered on the minutes.

After some other business, the board adjourned.

At a Meeting of the Board on Friday, July 29, the Parliamentary Committee reported that, having carefully considered the Metropolis Water Bill, as recently amended, they were of opinion that it was not one which could be considered satisfactory, or adapted to meet the just requirements of the inhabitants of the metropolis. After careful consideration, the committee came to the conclusion that the best course would be to prepare clauses to carry out the views of the board. Those clauses had been prepared, and Dr. Brewer, M.P., would give notice of them as amendments when the bill was being discussed in the committee of the House of Commons.

Mr. RICHARDSON said the object of the amendments was to constitute the board the local authority between the company and the consumers, and make the constant supply acceptable to the ratepayers.

Mr. FOWLER said the object of the promoters of the bill was to recoup all expenses from the pockets of metropolitan ratepayers. He hoped if the bill passed the third reading in the House of Commons the board would oppose it *in toto* in the House of Lords.

The report was agreed to.

COURT OF COMMON COUNCIL.

At the Meeting of the Court, on Thursday, July 28—the Right Honourable the LORD MAYOR presiding,

Mr. RUDKIN called attention to the supply of water in the City of London, and urged that it was of the utmost importance that they should have a continual supply. He knew of instances where persons were suffering from bad water in the City. That being so, he thought it would be advisable that the water companies should again supply water-posts, as they had done through frosty weather. Then the poor people in the courts and alleys would have a continuous supply of fresh water. The chairman of the Commissioners of Sewers might be able to make application to the water companies that these posts should be supplied.

Deputy DE JERSEY said he fully appreciated the feeling that had prompted the question now raised. On Tuesday last the commissioners broke up for their usual holidays, but everything should be done with the water companies to secure what Mr. Rudkin and all would regard as an absolute necessity.

Deputy STAPLETON asked if anything had been done with regard to the Metropolis Water Bill (No. 2). He asked this because the water companies were taking full advantage of the powers vested in them to raise the water-rates as high as they can, and he was sure that the time had arrived when the committee should take this matter up very seriously.

Mr. DRESSER ROGERS said he was glad to say that, under the direction of the law officers of the corporation, they had obtained, in the Act of Parliament proposed, a change by which the charge of the supervision of the question of water supply (especially so far as this bill was concerned) would be in the hands of the corporation itself.

QUALITY OF THE GAS SUPPLIED TO THE METROPOLIS.—Dr. Letheby, the chief gas examiner appointed by the Board of Trade, has recently reported to the Corporation of the City and the Metropolitan Board of Works on the quality of the gas supplied by the Chartered, the Imperial, and the South Metropolitan Gas Companies during the quarter which has just expired, and the following are the particulars thereof:—

Illuminating Power in Standard Sperm Candles.

Description of Gas and Testing-Place.	Maximum.	Minimum.	Average.
Chartered Company—			
Cannel gas—Cannon Street	28·8	22·9	25·48
" " Arundell Street.	26·4	23·3	24·81
Common gas—Cannon Street	19·4	16·6	17·70
" " Gray's Inn Road	18·7	16·4	17·41
" " Friendly Place	18·6	16·0	17·56
" " Arundell Street	18·2	15·8	17·49
Imperial Company—			
Common gas—Oakley Square	17·0	15·0	15·72
" " Camden Street	16·5	14·3	15·47
" " Graham Street	18·9	15·3	16·68
South Metropolitan Company—			
Common gas—Hill Street	18·3	14·7	15·88

These results show that the illuminating power of the gas has been equal to the requirements of the Act of Parliament at all the stations, and on all occasions but one, when the common gas was a little below the standard at Arundell Street. With respect to purity, Dr. Letheby reports that the gas of all the companies has been constantly free from sulphuretted hydrogen and from excess of ammonia, but that the quantity of sulphur has fluctuated to a large extent. The maximum, minimum, and average amount of sulphur in the gas at the several testing-places has been as follows:—

Grains of Sulphur per 100 *Feet of Gas.*

	Maximum.	Minimum.	Average.
Chartered Company—			
Cannel gas—Cannon Street	16·4	8·2	12·58
" " Arundell Street.	30·8	21·0	26·71
Common gas—Cannon Street	40·6	20·1	28·32
" " Gray's Inn Road	46·7	30·1	40·73
" " Friendly Place	34·1	10·6	22·47
" " Arundell Street	33·6	25·7	30·66
Imperial Company—			
Common gas—Oakley Square	36·9	31·1	34·28
" " Camden Street	29·6	20·2	25·02
" " Graham Street	32·1	23·0	27·90
South Metropolitan Company—			
Common gas—Hill Street	35·4	20·5	29·26

Dr. Letheby draws attention to the remarkable differences in the average amount of sulphur in the gas of the different stations, and he states that the proportions in the common gas of the Chartered Company are in many cases much larger than they were in the corresponding quarter of last year. The average proportion of sulphur at Gray's Inn Road, for example, was only 22·39 grains instead of 40·73; and at Friendly Place, 12·29 instead of 22·47; and at Cannon Street, 19·57 instead of 28·32. These results appear to indicate a less perfect system of purification at Beckton than was practised at the old works.

DR. WHITMORE'S REPORT ON THE QUALITY OF THE WATER SUPPLIED IN ST. MARYLEBONE, IN JUNE, 1871:—

June, 1871.	Total Solid Matter in degrees or grains per Imperial gallon.		* Loss by Incineration of Solid Matter in previous column.		Ammonia.
	June, 1870. 0°	June, 1871. 0°	June, 1870. 0°	June, 1871. 0°	0°
Distilled Water					
West Middlesex water	16·24	17·24	0·72	0·74	—
Grand Junction water	16·24	17·46	0·60	0·76	—

* The loss by incineration represents the amount of organic and other volatile matters contained in an Imperial gallon (70,000 grains) of water.

DR. WHITMORE'S REPORT ON THE QUALITY OF THE GAS SUPPLIED IN ST. MARYLEBONE, IN JUNE, 1871:—

June, 1871.	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quantity of Sulphur in 100 Cub. Ft.	Mean Quantity of Ammonia in 100 Cub. Ft.	Sulphuretted Hydrogen.
	*Mean of 22 Obsrt.	Highest.	Lowest.	Highest.	Lowest.	Grains.	Grains.	
Imperial Company's gas	16·71	17·10	16·12	24·20	11·02	32·98	1·72	None.
Chartered Company's common gas	16·41	16·79	15·73	41·57	16·65	34·13	2·31	None.
Chartered Company's cannel gas	23·36	24·87	22·78	32·57	14·67	27·70	2·45	None.

Mean of daily readings of barometer . . . . 29·77
" " " thermometer . . . 65·29

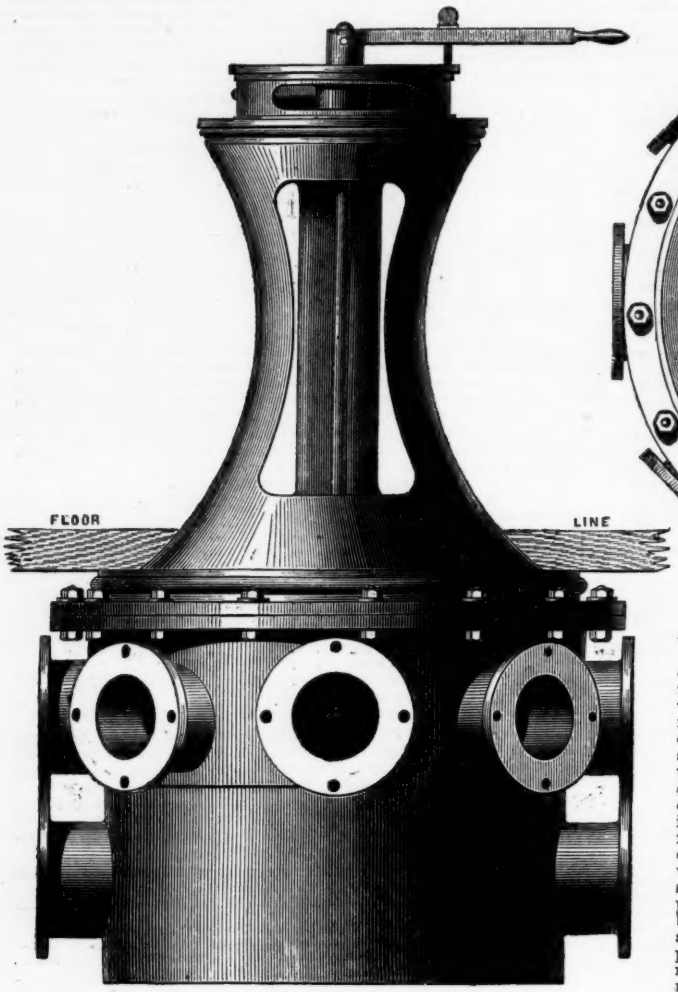
* Each observation consists of 10 readings of the photometer, at intervals of one minute.

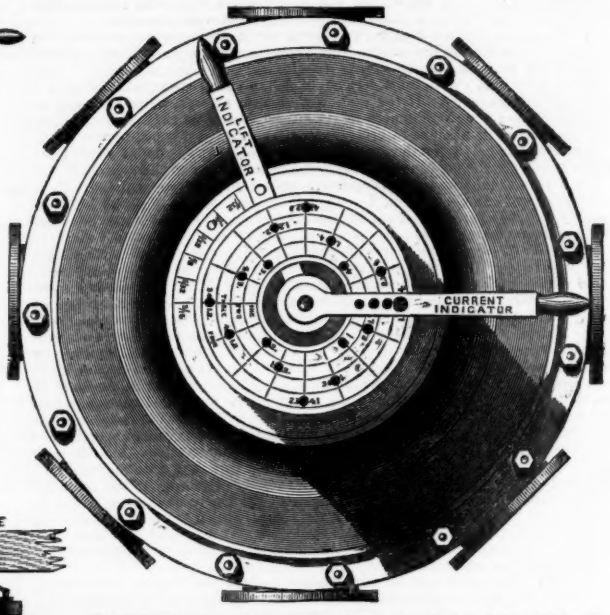
The mean illuminating power of the Imperial Company's gas during the month was equal to nearly 17 candles, and ranged from 17·10 to 16·12 candles; on seven occasions it exceeded 17 candles. The mean quantity of sulphur in each 100 cubic feet of this gas was 33 grains, and of ammonia 1·72 grains. The mean intensity of light of the Chartered Company's common gas was equal to 16½ candles, and ranged between 16·79 and 15·73 candles, the sulphur amounted to 34 grains, and the ammonia to 2·31 grains. The mean light of the cannel gas was equal to rather more than 23 candles, and ranged between 24·87 and 22·78 candles. The mean quantity of sulphur found in it was nearly 28 grains, and of ammonia 2½ grains. The pressure of all the gases was generally satisfactory, and in neither of them was sulphuretted hydrogen at any time degtected. These returns are obtained from the gas manufactured by the Imperial Company, at their Fulham works, and from the Chartered Company's gas, manufactured at their works, Horseferry Road, Westminster.

COLOMBO GAS AND WATER COMPANY, LIMITED.—At a meeting of the shareholders of this company, held in London last week, it was stated that the progress made in erecting the works and laying the mains was extremely satisfactory, and that it was expected a considerable portion of the town would be lighted with gas on the 6th inst.

HOLLINSHEAD'S PATENT RECESSED CONE-VALVE.

The accompanying engravings represent a centre change-valve, which is just being introduced to the notice of gas engineers by Messrs. Porter and Lane, of Fenchurch Street, London, and which has already been adopted with 15-in. connexions for the Nottingham Gas-Works (Basford extension).





The following description will enable our readers to judge of the advantages secured by this invention.

These valves are constructed on the principle of the ordinary plug-cock, the internal cones or plugs being formed with divisions, according to the purpose for which they are required. The cone and body of this valve are both recessed so as to leave projecting edges around their corresponding orifices, which act as the bearing surfaces, none of which are exposed to the gas during its passage through the valve. A simple arrangement of screw gearing with a lever is provided for slightly raising the cone from its seat, thereby doing away with all straining and friction during the turning of the valve. A graduated index-plate fixed on the capstan head denotes the extent of lift given to the cone in 32nds of an inch. Another lever and index-plate is provided as a means and a guide for setting the valve to work the gas through any one, two, or three, or the whole four purifiers in succession, in any desired order. This valve is capable of being changed with such precision and certainty, and so instantaneously that no risk can possibly arise of unpurified gas passing to the holder. The cone and body of the valve are turned and bored and ground together (ensuring a perfect fit) with the same facility as the ordinary plug-cock. These valves are made to suit all the purposes connected with gas-works. The essential novelties of the apparatus consist in the recesses given to the cone and body, and the mode of raising and easing the cone, which prevents any sticking, and allows it to be turned with great facility.

LECTURE ON THE ANALYSIS OF COAL GAS.

By H. Letheby, M.B., M.A., &c.,
Professor of Chemistry in the College of the London Hospital, and Chief Gas Examiner for the Metropolis.

[*Delivered before the British Association of Gas Managers at Dublin, Tuesday, June* 13.]

(*Continued from page* 547.)

But the simplest and readiest method of overcoming the difficulties occasioned by the presence of moisture in the gas is to dry it, as I am here doing, by passing it through a glass tube, about 18 inches long, and half an inch internal diameter, filled with fragments of fused chloride of calcium. By this means the gas is deprived of its moisture, and it enters the glass globe in such a condition as to require no other corrections than those for pressure and temperature.

And now let me show you experimentally another and much easier method of determining the specific gravity of coal gas. It is founded upon a physical law which has been long established for liquids of different densities, and which the late Professor Graham demonstrated in the cases of gases—namely, that the rates of effusion, or passage of different gases into a vacuum, through a minute aperture in a *very thin plate or disc of metal*, are inversely as the square roots of the densities or specific gravities of the different gases. This will be evident from the table before you.

Table No. 4.—*Specific Gravity, Square Root of Density, and Effusion Time and Effusion Rate of different Gases* (*Graham*).

Name of Gas.	Specific Gravity.	Square Root of Sp. Gr. or Effusion Time of given Volume.	1 ÷ Square Root of Sp. Gr. or Effusion Rate in given Time.
Hydrogen	0·0693	0·2632	3·7994
Light carburetted hydrogen	0·5549	0·7449	1·3424
Olefiant gas	0·9712	0·9855	1·0147
Carbonic oxide	0·9712	0·9855	1·0147
Nitrogen	0·9714	0·9856	1·0147
Atmospheric air	1·0000	1·0000	1·0000
Oxygen	1·1056	1·0515	0·9510
Sulphuretted hydrogen	1·1793	1·0860	0·9208
Carbonic acid	1·5290	1·2365	0·8087

So that the time of passage into a vacuum of equal volume of different gases varies as the square root of their densities, and therefore the velocities of passage will be in an inverse proportion, or as 1 divided by the square root of the density of the gas. Now if, instead of allowing the gas to stream through a fine hole in a very thin plate of metal into a vacuum, as I have just shown you, it be forced out by means of a constant pressure of a given height or column of water or mercury, the result will be the same, and it will afford the means of determining the specific gravity of a gas. When small quantities of gas are to be operated on, the instrument must be proportionally delicate, and the best form of it is that described and figured by Bunsen, in his work on "Gasometry." It consists of a small glass tube, which is open at the bottom, and furnished at the top with a well-ground glass stop-cock, having a tube into which there is fixed a thin disc of platinum foil, with an extremely small aperture; and in order that the gases under examination shall issue from the aperture under precisely the same conditions of pressure, there are certain precautions to be observed in graduating the height of the mercurial column, and in reading off the volume of the gas from its starting-point to the end. For our purpose, however, there is a simpler apparatus, designed by Schilling, and manufactured by Messrs. Wright and Co., of Westminster, who have kindly lent it to me for experiment. It is, as you see, a cylindrical glass vessel, capable of holding about 100 cubic inches of gas, having a stop-cock, which is guarded by a very thin disc of platinum, perforated with an extremely small hole. There is a tube for filling the vessel with gas, and a glass chamber for holding the necessary quantity of water. In using the vessel, you first ascertain the time required for the discharge of a given volume of atmospheric air, and then the time for the discharge of the same volume of coal gas. According to the preceding law, the square of the number of seconds required by the gas, divided by the square of the number of seconds required by the air, will give the specific gravity of the gas. But the experiment may be made with a meter, a governor, and a delicate pressure-gauge, as in Lowe's jet photometer, using a perforated disc instead of the steatite burner, which is really a tube, and therefore liable to error. In this way it is easy to determine the time required for the flow or passage of a given volume of gas, and this, conjoined with the height of the flame, would afford a far more reliable means of estimating the quality of gas than the durability test of Dr. Fyfe, or the jet photometer of Mr. Lowe. Some of you may remember that I described both of these methods of testing gas in the third lecture which I had the honour of giving to the association at their meeting in London in 1866, when I explained that the durability of a jet of gas, from an aperture of a given size, with a flame of a given height, as well as the pressure necessary to produce such a flame, were much relied on by the late Dr. Fyfe, of Glasgow, as a means of estimating the illuminating power of gas. The jet which he used had a diameter of the 1-33rd of an inch, and the flame was kept at a uniform height of 4 inches. In this manner he found that a given volume of gas of different qualities burnt out in different times, thus:—

Table No. 5.—*Durability of a Cubic Foot of Gas from*

Common Newcastle coal	50·5 minutes.
Wigan cannel	57·0 "
Lesmahago cannel	65·0 "
Wemyss cannel	75·0 "
Boghead cannel	81·0 "

And with respect to the pressure necessary to produce a flame 5 inches in height from a jet the 1-40th of an inch in diameter, he obtained the following results:—

TABLE No. 6.—*Pressure and Rate of Consumption of Gas of different Specific Gravities.*

Pressure. Inch.	Consumption per Hour. Cubic Feet.	Specific Gravity of the Gas.
0·6	0·67	0·841
0·8	0·77	0·729
1·0	0·86	0·552
1·2	0·94	0·595
1·4	1·02	0·551
1·6	1·09	0·515
1·8	1·15	0 486
2·0	1·21	0·461

His deductions from these results were that the specific gravity of gas, or, in other words, its quality as regards richness in condensable hydrocarbons, was inversely as the square roots of the pressures; and that the volume consumed in a given time was as the square roots of the pressures. He relied so much on this test that he thought it capable of taking the place of the ordinary photometer; and, no doubt, with proper precautions, using a perforated disc instead of a tubular jet, very accurate results might be obtained.

Chemical Analysis of Gas.

The constituents of coal gas (as shown in Table No. 1) are, as you perceive, very numerous, but it is hardly necessary, in the analysis of gas, to seek for more than the following—the proportions of which are in some cases exceedingly variable:—

TABLE No. 7.—*Chief Constituents of Coal Gas.*

Hydrogen	25 to 50	per cent.	by vol.
Light carburetted hydrogen, $C H_4$	35 „ 52	„	„
Condensable Hydrocarbons: Olefiant gas, C_2H_4; Propylene, C_3H_6; Butylene, C_4H_8	3 „ 20	„	„
Benzole and its series	? „ ?	„	„
Acetylene, C_2H_2	? „ ?	„	„
Naphthalin, $C_{10}H_8$	? „ ?	„	„
Carbonic oxide, CO	5 „ 9	„	„
Carbonic acid, CO_2	0 „ 2	„	„
Cyanogen, CN	? „ ?	„	„
Ammonia, NH_3	0·00 „ 0·06	„	„
Bisulphide of carbon, CS_2	0·004 „ 0·04	„	„
Aqueous vapour, H_2O	0·60 „ 2·50	„	„
Oxygen	0·00 „ 0·10	„	„
Nitrogen	0·00 „ 8·00	„	„

In the analyses which have been published of the average composition of the gas supplied to London, the chief constituents are as follows:—

TABLE No. 8.—*Average Composition of London Gas.*

	Common Gas (12-candle).	Cannel Gas (20-candle).
Hydrogen	46·0	27·7
Light carburetted hydrogen	39·5	50·0
Condensable hydrocarbons	3·8	13·0
Carbonic oxide	7·5	6·8
Carbonic acid	0·6	0·1
Aqueous vapour	2·0	2·0
Oxygen	0·1	0·0
Nitrogen	0·5	0·4
	100·0	100·0

The analysis of gas is generally effected by means of absorbent substances introduced into a measured volume of gas in a graduated glass tube, called an *eudiometer tube*, and to Professor Bunsen, of Heidelberg, is due the merit of giving accuracy to these investigations. The eudiometer tube which he employed was graduated independently of its volume, as you here see, and the values of the divisions were afterwards determined by very careful calibration. To avoid the difficulties occasioned by the wetting of the inside of the tube with the liquid reagents, he used them in a solid form, fastened to wires, by which means he was able to pass them up into the gas, and afterwards, when the required absorption was effected, to pull them out of it, leaving the interior of the tube clean and dry. A couple of platinum wires are fused into the top of the tube for the purpose of passing an electric spark, and so exploding mixtures of the gas with oxygen. This, with a delicate thermometer, a barometer, a mercurial trough, and a telescope for reading off the volume of the gas after each operation, constitute the apparatus of Bunsen; and, when used with proper care, it furnishes most accurate results. But the great drawback to the process is the time required for an analysis, the absorbents acting but slowly, and the gas requiring an uncertain time to return to its original temperature after the tube has been warmed by handling it; besides which it is necessary to have a room in such a situation and of such a structure as that its temperature shall remain unchanged during the performance of an experiment. These are difficulties of no ordinary character, and, therefore, attempts have been made to obviate them by using two sets of vessels—one for the absorption of the gas, which is called a laboratory tube, and another for its measurement, the endiometer, which is surrounded with water, and thus kept at a uniform temperature and pressure during the experiment. The first improvements in this direction were made by MM. Regnault and Reiset, in their memorable investigations on the composition of gases, and their apparatus and processes of analysis are fully described in Regnault's "Elements of Chemistry." Later still, in 1854, the apparatus was still further improved and simplified by Dr. Frankland, who described it in Vol. VI. of the "Quarterly Journal of the Chemical Society," saying that the conditions which he endeavoured to secure by it were the following:—

1. The determination of the gaseous volumes entirely independent of the pressure and temperature of the external atmosphere.

2. The self-correction of such determinations as regards the tension of aqueous vapour, and the variations in the density of mercury.

3. The expression of each change of volume in numerical differences as large as possible.

4, and lastly, to avoid the inconvenience and loss of time occasioned by tedious calculations, references to tables, &c., the numerical expression of each volume actually read off is either the true and corrected volume, or a number from which such volume can be at once obtained by the most simple arithmetical process.

The advantages of these qualifications or conditions are obvious, and I must refer you to his article on the subject for a detailed description of the apparatus. Other improvements of Regnault's instrument have been proposed by Dr. Williamson, Dr. Russell, and Mr. Ward; but they need not detain us further than by saying that they aim at still greater simplicity in the absorption and in the measurement of the gas. I apprehend, however, that few of you will resort to these complicated processes of investigation, and that I shall best consult the object of our meeting, if I describe to you the simplest means by which we can obtain a knowledge, even if it be but approximatively correct, of the composition of coal gas.

1. The *amount of moisture* in gas is always determined by means of fused chloride of calcium; and it may be used in the form of a pellet or ball let up into a measured quantity of gas over mercury, when the loss of volume from absorption indicates the amount of moisture present, care being taken to secure the proper conditions of temperature and pressure; or it may be estimated by slowly passing a known volume of gas through a previously weighed glass tube filled with fragments of chloride of calcium; and the increase of weight represents the amount of moisture present. This amount, in grains, may be converted into cubic inches by remembering that each cubic inch of aqueous vapour at a temperature of 60° Fahr., and a pressure of 30 inches of the barometer, weighs 0·1929 of a grain.

2. *Carbonic Acid* is qualitatively determined by merely passing the gas through a little lime or baryta water, which it renders milky. The actual amount of it may be ascertained by introducing a pellet of fused potash into the gas, which has been previously dried, as in the last experiment, by means of fused chloride of calcium, and the reduction of volume is then due to the absorption of carbonic acid; or it may be estimated by attaching a glass tube containing fragments of caustic potash to the chloride of calcium tube already described, and the increase in weight is due to carbonic acid. In this experiment care must be taken to remove all moisture from the gas by means of the chloride of calcium tube before it reaches the potash, because potash, like chloride of calcium, will absorb moisture, and thereby increase in weight. Every cubic inch of carbonic acid, at ordinary temperature and pressure, weighs 0·4717 of a grain.

3. *Oxygen.*—This is easily determined by means of an alkaline solution of pyrogallic acid—an acid which is largely prepared and used for photography. A measured volume of gas is let up into an ordinary Cooper's eudiometer tube, previously filled with water, as I am now doing, and after allowing the tube to stand in the vessel of water for a few minutes, so as to equalize its temperature, the volume of gas is read off. A piece of caustic potash, about an inch long, is then let up into the tube, and allowed to dissolve in the water—the tube being kept in motion with the thumb firmly over the opening, so as to dissolve the potash without allowing any of the gas to escape. When the potash is dissolved, the tube is returned to the vessel of water for the purpose of equalizing its temperature, and after a few minutes the volume of gas is read off; the loss, if any, is due to carbonic acid. A little pyrogallic acid, about half a thimbleful, in the condition of dry powder, is next to be put into the potash solution in the tube, and having placed the thumb over the orifice of the tube as before, it is to be well shaken, so as to bring all the gas into contact with the alkaline solution of pyrogallic acid. If oxygen be present, the solution will acquire a brown colour, and after returning it to the equalizing vessel of water, the amount of absorption can be read off, and this is due to oxygen. Once for all, I may say that when using these tubes for the analysis of gas, the greatest care must be taken to prevent the escape of gas, or the access of air, and the temperature of the gas must always be equalized by sinking the tube in the vessel of water, before the volume of gas is read off. With a little practice, all these conditions may be easily secured. If the determination of oxygen is effected in the eudiometer tube of Bunsen, or the laboratory tube of Frankland, over mercury, the absorption is effected by means of a ball of papier-maché soaked in a strong solution of pyrogallic acid in potash—the carbonic acid having been previously removed from the gas.

4. *Carbonic Oxide.*—This is removed from coal gas by means of a concentrated solution of sub-chloride of copper, formed by shaking a strong solution of chloride of copper in muriatic acid, with a quantity of copper filings, and keeping the copper filings always in the bottle with the solution. If care be taken to remove as much water as possible from the bend of the copper tube containing the gas, and to supply its place with the concentrated solution of sub-chloride of copper, the analysis may be made in the ordinary way, but if much water be present, the sub-chloride will be precipitated and rendered almost inert. It is better, therefore, to make the examination of the gas over mercury, letting up a ball of papier-maché, saturated with the acid solution of sub-chloride. After the absorption of the carbonic oxide, a little potash should be used to absorb the fumes of muriatic acid which may remain. It is hardly necessary to say that the experiment must be made with gas from which both oxygen and carbonic acid have been previously removed, because the former of these will be absorbed by sub-chloride of copper, and the latter by potash—thus giving erroneous results, if they are present.

5. *Condensible Hydrocarbons.*—These are freely absorbed by chlorine, bromine, and fuming sulphuric acid. If chlorine be used, as was the practice of Dr. Fyfe, the tube must be kept in the dark, or it will combine with hydrogen and light carburetted hydrogen, and so give false results. Bromine, however, has the property of combining with the hydrocarbons, without touching the other constituents of coal gas, and if it were not that it forms ethereal compounds, which diffuse vapour through the gas, and so affect its volume, the results would be very trustworthy. As it is, indeed, they are sufficiently reliable for common purposes. I take, as you now see, a known volume of coal gas in an ordinary Cooper's tube, and having equalized its temperature and read its volume, I drop into the water at the bend of the tube a single drop of bromine, and then on closing the tube with my thumb, I agitate the gas and bromine water with just enough violence to diffuse the vapour of bromine throughout the tube. After standing for five or six minutes, and observing that there is still enough bromine to colour the gas, I add a small piece of caustic potash, and again close the tube and agitate it. As you perceive, when I open the tube under water, there has been considerable absorption and condensation. I now return the tube to the equalizing vessel, and when the temperature is restored, I read off the absorption, which is due to carbonic acid and condensable hydrocarbons. As the amount of the first has already been determined, the volume of hydrocarbons is easily obtained.

But, as I have stated, there is a slight source of error in this method of determining the amount of condensible hydrocarbons, because of the presence of an uncertain quantity of the ethereal vapour of the bromine compounds; and hence, in accurate investigations, it is best to absorb the hydrocarbons by means of a ball of wood charcoal or coke impregnated with fuming sulphuric acid. This, of course, must be done in a tube over mercury—a pellet of potash, or a piece of cotton wool, saturated with a solution of potash, being afterwards used to absorb the residual acid fumes; but even this method is not sufficient to discover the exact nature of the hydrocarbons, for you will perceive, by reference to the diagram (Table No. 1), that the hydrocarbons, which are condensible by fuming sulphuric acid, contain very different proportions of carbon, and are, therefore, of different values as illuminating agents. Mr. Lewis Thompson has proposed to solve this question by ascertaining the specific gravity of the gas before and after its condensation with bromine, and thus to deduce the specific gravity of the vapour of the hydrocarbons. Let us take an example from a specimen of Boghead cannel gas. Suppose the gravity of the gas before condensation with bromine was 0·752, and after such condensation it was 0·555; and suppose also that the amount of condensation with bromine was 30 per cent. by volume, it follows that if the weight of the residual 70 volumes ($70 \times 0{\cdot}555 = 38{\cdot}85$) be subtracted from the weight of the original gas ($100 \times 0{\cdot}752 = 75{\cdot}20$), the residue ($75{\cdot}20 - 38{\cdot}85 = 36{\cdot}35$) must be the weight of the 30 volumes condensed by bromine; and, therefore, $36{\cdot}35 \div 30 = 1{\cdot}212$, which is the specific gravity of the hydrocarbon vapours in question. The effusion tube of Bunsen, already described, is particularly well suited for the quick determination of the specific gravity of the gas before and after its treatment with bromine. A still better and more exact method of estimating the proportion of carbon in the condensed vapours is to mix the gas with oxygen, and, after exploding it, to ascertain the amount of carbonic acid produced. If this be done with the original gas, and then with the gas from which the hydrocarbon vapours have been removed by means of fuming sulphuric acid, the difference in the proportions of carbon will furnish the necessary data for estimating the composition of the condensed vapours. This will be evident from what follows:—

6. *Estimation of Marsh Gas* (*light Carburetted Hydrogen*), *Hydrogen*, *Carbonic*

Oxide, and Nitrogen.—As there are no absorbents for hydrogen and light carburetted hydrogen, it is necessary to determine their proportions in coal gas by exploding them with oxygen, and so converting them into water and carbonic acid, from which the amounts of hydrogen and carbon may be easily ascertained. The method of proceeding is, first, to remove the condensible hydrocarbons and carbonic acid from coal gas by means of fuming sulphuric acid, and a ball of cotton saturated with a solution of caustic potash, as I have just described. In this way we obtain a mixture of hydrogen, light carburetted hydrogen, carbonic oxide, and nitrogen. About one cubic inch of this mixture is transferred to an exploding eudiometer tube, moistened on the inside with a little water, and the exact volume of it is read off. It is then treated with about four times its volume of pure oxygen gas, and again the volume is read off. After this the mixture is exploded by passing an electric spark across the platinum wire of the tube—taking care to press so firmly upon the open end of the tube as to guard against loss of gas from the force of the explosion. In the straight tube of Bunsen this is done by pressing the tube firmly upon a piece of india-rubber placed at the bottom of the mercurial trough; and in the case of the bent eudiometer tube of Ure, which I am now using, it is effected by holding the thumb forcibly upon the open end of the tube. After the explosion the volume of the gas is again read off. And now we proceed to estimate the quantity of carbonic acid produced by means of a ball of cotton saturated with a solution of caustic potash. The loss of volume, after such treatment, is obviously due to the absorption of carbonic acid; and the residual gas must be a mixture of the nitrogen contained in the original gas, and of the oxygen which has been used in excess. Having, therefore, noted its exact quantity, we add about four times its volume of pure hydrogen, and again note its volume. The electric spark is once more passed across the platinum wire, and thus the oxygen is made to combine with the hydrogen, and to form water. For the last time the volume is again noted, and, as two volumes of hydrogen unite with one volume of oxygen to form water, the loss of volume, divided by three, gives the proportion of oxygen present, and this, subtracted from the volume of the gas, before the hydrogen was added to it, gives the proportion of nitrogen present! In all these experiments the greatest care must be taken to guard against errors from alterations of temperature and pressure.

And now comes the question—How are we to determine from these results the proportions of hydrogen, light carburetted hydrogen, carbonic oxide, and nitrogen, which were the constituents of the gas? If you look at the diagram (Table No. 1) you will observe that hydrogen combines with half its volume of oxygen to form water, which occupies no gaseous volume in the eudiometer tube; and that light carburetted hydrogen (there called methyl-hydride) consumes twice its volume of oxygen to form water, which has no gaseous bulk, and its own volume of carbonic acid gas; while carbonic oxide takes half its volume of oxygen and produces its own volume of carbonic acid. It is evident, from this, that the water produced occupies no gaseous bulk, and the volume of carbonic acid produced represents the combined volumes of light carburetted hydrogen and carbonic oxide, while the volume of oxygen has its determinate relations to each of them, consequently the respective proportions of the constituent gases may be found from three simple equations; for if the volume of the original gas (*minus* the nitrogen) be called G, and that of the oxygen consumed, O; and that of the carbonic acid produced, C; it is manifest that

$$G = H + C H_4 + C O - \text{the three constituent gases.}$$
$$O = 0{\cdot}5 + 2 + 0{\cdot}5 - \text{the oxygen required by each.}$$
$$C = 0 + 1 + 1 - \text{the carbonic acid produced.}$$

And suppose that, in an experiment, it has been ascertained that G is equal to 11 volumes, O to 11·5 volumes, and C to 5, then, as the volume of carbonic acid produced represents the combined volumes of the light carburetted hydrogen and carbonic oxide of the gas, it follows that

$$G - C, \text{ or } 11 - 5 = 6, \text{ is the volume of the hydrogen present.}$$

And $\frac{2O - G}{3}$ or $\frac{23 - 11}{3} = 4$, is the volume of light carburetted hydrogen present

And the last deducted from the total volume of carbonic acid produced, or $5 - 4 = 1$, must be the volume of carbonic oxide present.

If it be required to determine the amount of carbon in the condensible hydrocarbons, it is necessary to explode a given volume of the original gas, before the hydrocarbons have been absorbed, by mixing it with about five times its volume of pure oxygen, and then ascertaining the proportion of carbonic acid produced. The excess of this over that obtained by the last method of investigation will furnish the necessary data for the problem.

7. *Acetylene* is easily recognized in coal gas by passing it through an ammoniacal solution of the sub-chloride of copper, when a dark brown precipitate is formed of acetylide of copper. The experiment is before you, and I have started it by first putting into a double-necked bottle a little of the sub-chloride of copper already mentioned, and then, while the gas is bubbling through the liquid, and has displaced the whole of the atmospheric air in the bottle, I add an excess of a solution of strong ammonia, taking care that the liquid becomes perfectly clear, and of a deep blue colour. In this condition it will, as you here perceive, absorb acetylene and form the copper compound.

8. *Benzole and its series* are always discoverable in coal gas by passing it through a little of the strongest fuming nitric acid, whereby nitro-benzole, having the odour of bitter almonds, is quickly formed. I am here making the experiment in a small Liebig's potash apparatus, using a little water after the acid to absorb the fumes.

9. *Naphthalin* and *Anthracin* are not to be discovered in gas by any easy chemical test, although the former is sometimes present in such quantity as to form inconvenient deposits in those parts of the main-pipes which are exposed to cold.

10. *Ammonia.*—This impurity of gas is easily recognized by allowing the gas to blow upon a piece of moistened turmeric paper, when, if the proportion exceeds 2 grains per 100 cubic feet of gas, the paper is quickly reddened. The method employed for estimating the quantity of ammonia is to take a glass tube, about 8 or 9 inches in length, and nearly 2 inches in diameter, the ends being drawn out so as to fit it to flexible tubing. This tube is filled with small fragments of glass or with small glass beads, which are moistened with a known quantity of a standard solution of oxalic acid. The best proportion is a solution of 7·4 grains of crystallized oxalic acid dissolved in 100 septems of water. Fifty septems of this solution, representing 1 grain of ammonia, will sufficiently moisten the fragments of glass or beads in the tube. The tube must then be attached to the *inlet* of the meter, in order that no error may arise from the action of the water of the meter; and after passing 10 cubic feet of gas, the proportion of ammonia absorbed by the solution of oxalic acid must be determined by means of a standard solution of ammonia, and an alcoholic tincture of logwood (*hæmatoxylin*), which is sometimes improperly called hœmatine. This solution, when added to water, is yellow, as long as there is the least trace of acidity; but directly it receives the smallest excess of alkali it acquires a beautiful red or pink colour, and thus it becomes the means of ascertaining when the acid solution, which has been removed from the ammonia tube, is exactly neutralized by the standard solution of ammonia. Suppose, therefore, that 50 septems of the original oxalic acid solution, when coloured with tincture of logwood, required its own volume (50 septems) of the standard solution of ammonia to neutralize it—that is, to change the yellow colour of the hœmatoxylin to pink—and suppose that, after passing 10 cubic feet of gas, the 50 septems required only 25 septems of the standard solution of ammonia to change the colour, it is manifest that the rest of the ammonia (equal to that in 25 septems of the standard solution) must have come from the gas; and as the 50 septems of acid, as well as the 50 of standard ammonia, represent 1 grain of ammonia, there must have been 0·5 of ammonia in the 10 feet of gas, and this is equal to 5 grains of ammonia per 100 cubic feet of gas. You may see from the experiment which I am now performing how delicate is this method of investigation, and the only precautions necessary are the making of the solution of oxalic acid and the testing of the standard solution of ammonia at the time of each experiment, as both of these solutions are liable to decomposition if they are kept.

Nessler's test is also a delicate test for ammonia—so delicate, in fact, that a quart bottleful of coal gas will generally betray the presence of this impurity, if it be agitated with 4 or 5 ounces of distilled water slightly acidulated with oxalic acid, and then tested with Nessler's solution of bichloride of mercury and iodide of potassium in caustic alkali.

11. *Bisulphide of Carbon, and other Sulphur Compounds.*—The recognition of these compounds is dependent on the combustion of a considerable volume of gas, and the collection of the sulphur products. It is generally done in the apparatus which I designed for the purpose many years ago, and which consists of a Leslie's burner, with a glass trumpet-tube for conveying the products of combustion into a glass cylinder, where they are arrested by condensation. There is also a contrivance for delivering the vapour, or rather the ammoniacal gas of the strongest liquor ammoniæ into the trumpet-tube immediately above the point of combustion. The gas is burned at the rate of about one cubic foot an hour, and the sulphur products, together with most of the water produced by the combustion of the hydrogen of the gas, are arrested in the glass cylinder. After burning for 24 hours, the experiment is completed, and the products are removed from the cylinder, and submitted to examination for sulphur. About one-fourth, or even, less of the liquid is evaporated to dryness in a weighed beaker or thin porcelain capsule, and in most cases the residue, which consists of sulphate of ammonia, with a very little nitrate of ammonia, will at once determine the proportion of sulphur; for every 10 grains of the residue (sulphate of ammonia) represent 2·42 grains of sulphur. In careful experiments, it is necessary to redissolve the residue in distilled water, and after making it hot, to precipitate it with a slight excess of a solution of chloride of barium, made slightly acid with muriatic acid. If the solution be kept boiling for a few minutes after the addition of the chloride of barium, the precipitate will be more easily thrown down; and after decanting the clear solution, and collecting the precipitate of sulphate of baryta upon a filter, washing with hot distilled water, and then drying and incinerating in a platinum crucible until the filter is burned away, and the precipitate left in a perfectly white condition, it is to be weighed, when every 10 grains of it represent 1·37 grains of sulphur. The precautions which are necessary to ensure accurate results with this apparatus are the following:—In the first place, the gas should always burn with a slight yellow tip to each of the jets. Secondly, the trumpet-tube should rest upon the arms of the burner, so as to prevent the escape of any of the products of combustion; and to ensure this I have found it necessary to enclose the jets of the burner in a perforated disc of tin or cardboard, which rests upon the arms of the burner, and supports the trumpet-tube. Thirdly, the trumpet-tube should have an opening at the larger end, which surrounds the burner, of from 3 to 3½ inches diameter, and the bore at the smaller end, where it is fitted to the cylinder, should be from 1 to 1½ inch in diameter. Fourthly, the cylinder should be about 13 inches long, and 4½ inches diameter, with a neck at each end about 2 inches long and from 2 to 2½ inches diameter. Fifthly, the liquor ammoniæ used in the experiment should be of full strength, and not less than two fluid ounces in bulk; and, lastly, the temperature of the cylinder should be maintained as high as possible by covering the glass with a folded cloth. Very recently a modification of this apparatus has been proposed by the gas referees of London, whereby the products of combustion are more securely retained. The burner is a Bunsen jet, capable of consuming about half a cubic foot an hour, and it is enclosed within the trumpet-tube. Solid lumps of carbonate of ammonia are used in the place of liquor ammoniæ, and the cylinder is placed in an upright position instead of horizontal—the condensed products of combustion being allowed to flow off through a descending pipe. I find, however, that with the precautions which I have described, the results obtained by the old form of apparatus are strictly comparable with those of the new.

12. *Sulphuretted Hydrogen* is known by its action on lead paper, even when the impurity is present in a very minute quantity in coal gas—as, for example, in a millionth part of it; and this is the common test for it. Traces of sulphuretted hydrogen may be quantitatively estimated by means of a solution of iodine of known strength. The gas is measured by passing it through a meter, and then through a glass tube containing fragments of glass moistened with a solution of pure potash or pure soda; the pure soda of commerce, which is obtained by the oxidation of sodium in distilled water, is well suited for the purpose. When a considerable volume of gas has passed through the tube, the alkaline solution is treated, while still in the tube, and without exposing it for a moment to the air, with distilled water which has been acidulated with acetic acid, and boiled and cooled without access of air, as atmospheric oxygen vitiates the results. The solution, which must be acid, is then treated with a few drops of solution of starch; and by means of an accurately graduated pipette, a standard solution of iodine is dropped into the liquid until the blue colour of the starch ceases to disappear when the liquid is stirred. This indicates the point when the decomposition of the sulphuretted hydrogen in the acid liquid by the iodine is exactly complete, and knowing the strength of the iodine solution the proportion of sulphuretted hydrogen is determined. Larger proportions of sulphuretted hydrogen, as those in raw gas, may be determined by absorbents, as by means of a ball of peroxide of manganese, made somewhat compact by moulding it with water and drying it. An ammoniacal solution of chloride of copper will also absorb the sulphuretted hydrogen, and will yield flakes of sulphide of copper, which can be easily separated by decantation; and after conversion into sulphate of copper by means of nitro-muriatic acid, the proportion of sulphur can be readily estimated in the form of sulphate of baryta, as I have already described.

These are the principal constituents of coal gas, and you will perceive that although, in some cases, the quantitative estimation of them is difficult and troublesome, yet, in most instances, the chief and most important constituents are readily determined by processes which are quite within the reach of ordinary manipulative skill.

West Surrey Water Company.—The prospectus of this company appears in our advertising columns to day. The company has been formed for the purpose of supplying water to the districts of Chertsey, Walton-on-Thames, Hersham, Oatlands Park, Weybridge, Cobham, Byfleet, and Shepperton. These places, it is stated, are almost entirely dependent upon wells for their water supply, which, in times of drought, is liable to frequent interruption. The districts contain houses of an annual value exceeding £70,000, in addition to railway stations, breweries, and other large establishments. The proposed supply will be taken from the Thames, near Walton Bridge, where it is to be passed through filter-boxes, pumped into the mains, and conveyed to a reservoir, to be constructed on St. George's Hill, near Oatlands Park. The capital of the new company is £31,000, of which £25,000 is in shares of £10 each, with £6000 borrowing powers. It is proposed to issue 1250 shares of £10 each, of which there is to be paid on application £1 and on allotment £1, subsequent calls not to exceed £2 each, or be made at intervals of less than three months.

Halifax Water Supply.—On Wednesday last the Mayor of Halifax cut the first sod of a new reservoir for the borough of Halifax, at Widdop, near Hebden Bridge, 15 miles from Halifax. He was accompanied by the members of the corporation, and a number of representatives of local boards which have contracted with the Halifax Corporation for a supply of water to their several districts. The reservoir when completed will be over a mile in length, and will cost £88,000, and be three years in construction. Its capacity will be 640 million

gallons, and will cover an area of 106 acres. Mr. Bateman, C.E., is the engineer. The spot selected for the water-works is singularly adapted for the purpose, and the supply of water both good and plentiful. A sumptuous dinner was served in the evening to the gentlemen taking part in the ceremony, at the White Horse Hotel, Hebden Bridge.

WORKMEN'S TREAT—CRYSTAL PALACE DISTRICT GAS COMPANY.—For many years it has been the custom of the directors of this company to give their *employés* an annual holiday, and also to make the holiday complete by providing them with a liberal repast and the means of united enjoyment. Business necessities, however, prevent the whole staff of the establishment being absent at one time, and therefore the holiday is divided into two parts, one half taking their day's holiday in one week, and the remainder following suit the succeeding week. This year the day selected for the first holiday was Tuesday, the 18th of July, when about 100 of the officials and workmen in the employ of the company paid a visit to the charming scenery in the neighbourhood of Knockholt Beeches. A substantial dinner was provided at the Three Horse-Shoes, to which full justice was done. After dinner, Mr. Cathels, the company's engineer, proposed the toast of the day, "Success to the Crystal Palace District Gas Company," and, in doing so, took occasion to remark that the directors had determined that the men whom it had been necessary hitherto to employ on Sundays should for the future have their Sundays at home. They were determined to give this plan a fair trial, and he could only say that he should do his utmost to make it successful, and it would be to him a great pleasure if they could go on all the year round without Sunday labour. Contracts were being issued for additional buildings at the works, and a portion of the buildings would be appropriated to baths, which he had no doubt would be a great boon to those employed by the company. The healths of Mr. Cathels, the engineer, and Mr. Magnus Ohren, the secretary, were subsequently drunk with great enthusiasm. Various amusements were then indulged in until ten-time, and subsequently the sound of the bugle reassembled the company, who once more took their seats in the vehicles provided for their conveyance, and journeyed safely to their destination, the gas-works, Lower Sydenham, where they were welcomed with boisterous cheers by those who had assembled to greet their return.

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MAGNUS OHREN, Secretary.

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TO BE SOLD, a set of 3-in. Condensers and WASHER; 14 pipes, 9 ft. high, with bends, &c., complete. As good as new.

Apply to R. JOHNSTON, LYSTON.

TWO Second-hand Station Meters for Sale, one 15,000 feet per hour (square), in thorough good working order, having been overhauled last year. To be seen at the Gas-Works, Paisley.

One 2500 feet per hour, to be seen at the Gas-Works, Lurgan, Ireland.

For prices, apply to W. AND B. COWAN, Buccleuch Street Works, EDINBURGH.

TO BE SOLD, at the Rhyl Gas-Works, North Wales, 23 15-in. Mouthpieces for Clay Retorts, ascension-pipes, hydraulic main, and delivery pipes complete. One set of 8-in. double vertical Condensers. One Station-Meter (Bent and Co.), with valves and connexions complete, to pass 4000 feet per hour. Four sets of Purifiers, respectively 6 ft. by 3 ft. 6 in., 4 ft. by 5 ft., 4 ft. by 4 ft., with connexions, &c., complete. Large lot of cast and wrought iron, comprising the interior Fittings of a 10,000 feet Gasholder; and sundry other materials.

Applications to MILES R. PARTINGTON, Secretary, Gas Company, Limited, RHYL.

FOR SALE, Three Dry Lime Purifiers, one 12 ft. by 8 ft. by 4 ft. deep, two 8 ft. by 6 ft. by 3 ft. 3 in. deep, with wrought-iron covers, travelling crane, and lifting apparatus, valves, and necessary 6-in. connexions.

For price, apply to J. WILSON, Gas-Works, ABINGDON.

TO GAS COMPANIES AND OTHERS.

FOR SALE CHEAP, a Condenser, consisting of cast-iron box, 9 ft. long, with ten 4-in sockets cast on top; ten 4-in. upright pipes, 9 ft. long and semicircle bends complete.

Also a powerful portable PROVING PUMP, in working order, to prove socket-pipes, &c.

Apply to W. J. HOLLANDS, Iron Merchant, Sun Iron Wharf, Bankside, LONDON, S.E.

FOR SALE CHEAP, a set of Three PURIFIERS, 5 ft. by 5 ft., inside measure, with travelling crane and lifting apparatus complete, with one of Cockey's centre-valves and 5-in. connexion.

The above are good, but too small for present consumption.

Address A. THOMAS, Gas-Works, Alton, HANTS.

FOR SALE, a combined Purifier and CONDENSER, with centre change-valve, suitable for 300 lights. Extreme size 7 ft. 5 in. by 6 ft. by 3 ft. 1 in. high.

Apply to the BRYMBO COMPANY, near WREXHAM.

FOR SALE, Four Dry Lime Purifiers, 6 ft. square, 3 ft. 10 in. deep, three shelves in each, wrought-iron covers; three Walkers 6-in. valves to each purifier. They are nearly new, and are being removed to be replaced by others of larger size.

Also a Circular STATION-METER, capable of passing 4000 feet per hour.

The Directors will not refuse any reasonable offer.

For further particulars, apply to the MANAGER of the Works, Newport, ISLE OF WIGHT.

PRIVATE TELEGRAPHS FOR GAS AND WATER WORKS.

THE Electric Telegraph Department of our business is most efficiently conducted by an experienced staff. CONTRACTS entered into for maintenance and erection of lines for Gas and Water Companies, private residences, hotels, steamships, &c. Bailey's simple A B C instrument is stronger and less liable to derangement than any other in the market.

Sole makers of L. J. Crossley's Electrical Speed Indicator.

Sole makers of Chatwood's Patent Electrical Ship's Log.

Sole makers of Bailey's dust-proof and damp-proof Signal-Bell.

Managers of Gas and Water Works are invited to ask us for our quotations, or for any information connected with Telegraphy.

JOHN BAILEY AND CO., Turret Clock Makers to the late Earl of Rosse, the British and Foreign Governments, &c., Electric Telegraph Engineers, and General Brassfounders, Albion Works, Salford, MANCHESTER.

ON SALE, a good second-hand Station- METER, 8000 feet per hour, West and Gregson make, bye-pass, &c.

Apply to W. LONGWORTH, Gas Offices, Dukinfield, MANCHESTER.

BEWDLEY (WORCESTERSHIRE) GAS-WORKS.

TO BE LET, the above Gas-Works, for a term of years to be agreed upon. The works are in good condition.

For particulars, apply to Mr. PARDOE, Attorney, BEWDLEY

TO TAR DISTILLERS, &c.

THE Directors of the Leighton Buzzard Gas and Coke Company invite TENDERS for their surplus Tar, about 15,000 gallons yearly, for One, Two, or Three years, from Sept. 1, 1871. Works about half a mile from the Grand Junction Canal.

Tenders to be sent to the Manager, WILLIAM MELLOR, Gas-Works, LEIGHTON BUZZARD.

July 26, 1871.

MANUFACTURE AND SUPPLY OF GAS AT THE ROYAL VICTORIA HOSPITAL AT NETLEY.

NOTICE is hereby Given, that the Secretary of State for War is prepared to receive, on or before Thursday, the 17th of August, TENDERS for the MANUFACTURE of GAS at the existing Gas-Works at Netley, and the supply of gas to the Royal Victoria Hospital at that place, for a period of Seven years, commencing from Sept. 1, 1871.

Tenders must be made upon the proper form, which may be had on application to the Control Officer at Netley, of whom also any further information may be obtained.

THOMAS HOWELL, Director of Contracts.

War Office, Pall Mall, S.W.,

July 31, 1871.

WILLIAM FOSTER, Analytical and Consulting Chemist, Gas Examiner to the Metropolitan Board of Works, late Senior Bell Scholar in Practical Chemistry in the School of Pharmacy, London.

The Analysis of Waters and other investigations conducted in connexion with Water and Gas Companies.

Experiments made in the Photometer for Makers of Gas-Burners, and questions connected with Gas Lighting investigated.

OFFICES: 104, HILL STREET PECKHAM, LONDON, S.E.

MODERN STREET LIGHTING, by WILLIAM SUGG, A.I.C.E., price 1s. 6d., is now ready, and will be forwarded post free for 19 stamps.

W. SUGG, Vincent Works, Vincent St., WESTMINSTER, S.W.

BRONNER'S PATENT GAS-BURNERS give 90 per cent. of light, as compared with 27 per cent. given by ordinary burners, with equal consumption of gas.—*Vide* "Gas Referees Report," published June, 1869.

HENRY GREENE AND SON, Sole Consignees of Brönner's Patent Improvements in Gas Lighting, 16 and 17, King William Street, E.C., and 138, Regent Street, LONDON. Agents wanted.

THOMAS CARR & SON,

MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS,

&c., &c.,

SCOTSWOOD FIRE-BRICK WORKS,

NEAR

BLAYDON-ON-TYNE.

THE

SAO PEDRO BRAZIL

GAS COMPANY, Limited.

Registered under the Companies Acts, 1862 and 1867.

Capital, £110,000, in 22,000 shares of £5 each.

The liability of each Shareholder is limited to the amount of his shares.

£1 to be paid on application, and £1 on allotment.

Further Calls not to exceed 10s. per share, at intervals of not less than Three Months.

SHOULD NO ALLOTMENT BE MADE, THE DEPOSIT WILL BE RETURNED IN FULL.

Interest, at the rate of £5 per cent. per annum, by warrants sent to each Shareholder, will be paid quarterly, on the capital called up, from the date of payment on allotment, until the expiration of twelve months from the time Gas shall have been first supplied to the public.

DIRECTORS.

The Hon. HOWE BROWNE, Deputy-Governor of the Chartered Gas Company, Chairman.
E. H. BRAMAH, Esq., Director of the Recife and Sao Francisco (Pernambuco) Railway Company, Lim.
GEORGE BROWNLOW, Esq., 33, Brunswick Gardens, Kensington.
C. F. COLLIER, Esq., Director of the Bombay Gas Company, Limited.
H. DEFFELL, Esq., Director of the Chartered Gas Co.
J. ROMANES, Esq., Director of the Malta and Mediterranean Gas Company, Limited.
Major W. S. STUART, R.E., Director of the Hong Kong and China Gas Company, Limited.

CONSULTING ENGINEER.

ALFRED UPWARD, Esq., M.I.C.E., Chartered Gas Company, Goswell Road.

SOLICITORS.

Messrs. NEWMAN, DALE, AND STRETTON, 75, Cornhill.

BANKERS.

The LONDON and COUNTY BANK.

BROKERS.

Messrs. ALEXANDER AND Co., 7, Tokenhouse Yard.

AUDITORS.

Messrs. JAMES, EDWARDS, CASH, AND STONE, Public Accountants; WILLIAM MARSHALL, Esq., Secretary to the Bombay Gas Co., Limited.

SECRETARY (pro tem.).
E. P. ROWSELL.

TEMPORARY OFFICES.
79, GRACECHURCH STREET, LONDON, E.C.

ABRIDGED PROSPECTUS.

This Company is formed to light with Gas the following important maritime cities in the Province of Sao Pedro, in the Empire of Brazil:—Porto Alegre (the capital), Pelotas, and Rio Grande, containing together a population of 56,000.

The above cities are steadily increasing in population and wealth, and contain 8000 houses, five theatres, nine ball or concert halls, and about 100 other public buildings. As they are seaports, the land carriage of coals, which usually forms a very large item of expenditure in foreign inland cities, will be entirely saved.

The concession comprises, amongst others, the following terms:—

1. A guarantee by Government to take 1000 lamps for the streets and squares, at the rate of 21½ reis per hour for gas equal to 9 candles, for an average night of 11 hours, equal, at the present rate of exchange of 25d., to £8 19s. 10d. per lamp per annum. The number of lamps is to be increased within two years from this date to 1250. The Government Engineer has reported that, to light only the streets of the towns effectually, 2873 lamps will be required.

At the end of the term for which the concession is granted, the Government will have the option of purchasing the works at a valuation, to be determined by arbitration, or of renewing the concession.

An approximate estimate has been made by Mr. Upward, the Company's Consulting Engineer, of the annual receipts and expenditure for three years, showing a profit of 14 per cent. per annum, which has been based on the use of English coal; but there are coal-mines in the neighbourhood of two of the cities, and it is anticipated that the coal may prove suitable for the manufacture of gas. The Directors call attention to the subjoined letter from Mr. Upward to them.

The shares in the Rio de Janeiro Gas Company, Limited, whose works have been in operation for some years, stand in the market at above 50 per cent. premium, and their last report shows a net profit of more than 15 per cent. per annum on their capital of £600,000.

Full prospectuses, with forms of application for shares, may be obtained at the Bankers, Brokers, and at the Office of the Company.

Letter from Mr. Upward, above referred to.
Chartered Gas Company's Office, Goswell Street, June 30, 1871.

Gentlemen,—Having made a very careful estimate of the cost of carrying out the works intended by your Company, and required by the concession from the Government of the Province of Sao Pedro, Brazil, including the land for the buildings, and having made a very liberal allowance for contingencies, I am of opinion that a profit of 14 per cent. on the capital of the Company will be realized when the works contemplated are in full operation. The sum of £110,000 includes an ample allowance for working capital, in addition to the cost of works and land.—I am, Gentlemen, your obedient Servant, A. UPWARD, M.I.C.E.

To the Directors of the Sao Pedro Brazil Gas Co., Limited.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

IMPROVED CONSUMERS GAS-METERS,

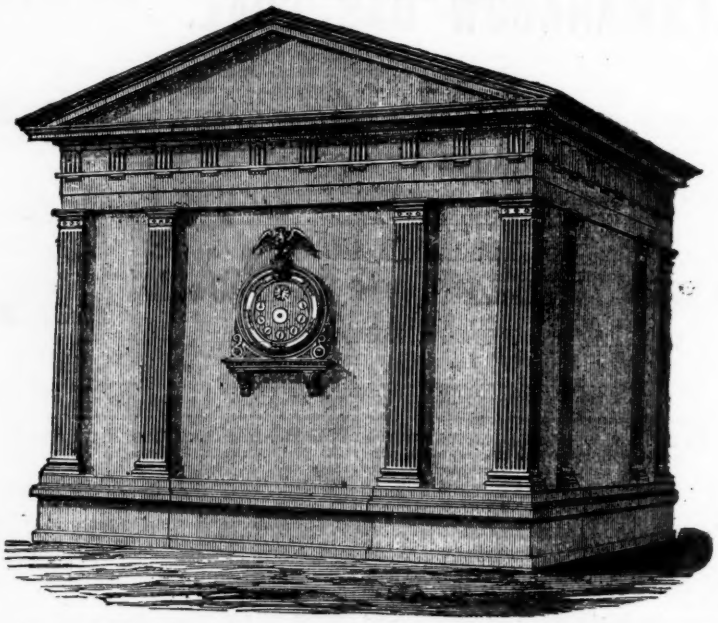
Of the best material and workmanship, carefully adjusted to the requirements of the British Sales of Gas Act and Foreign Standards of Measures.

PATENT FIXED WATER-LINE GAS-METERS,

Which are uniform with the ordinary Meters, and register with minute accuracy.

IMPROVED DRY GAS-METERS,

IN BEST TINNED IRON CASES.



GAS STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, EXHAUST-GOVERNORS, &c.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c., ON APPLICATION.

WILLEY & FORD,

GAS ENGINEERS, EXETER,

Having completed their NEW WORKS in the COMMERCIAL ROAD, for the supply of every description of GAS APPARATUS, respectfully invite the attention of GAS COMPANIES and others to their various Manufactures, especially appertaining to GAS-WORKS.

ENGINEERING DEPARTMENT.

They have lately had the pleasure of ERECTING NEW GAS-WORKS and LIGHTING the following towns:—

Chagford, Holsworthy, and Northtawton, Devon; Chard and Chardstock, Somerset; Trecastle, Breckonshire; and Finchcox, Kent.

They have also executed many improvements and extensions at the following Gas Companies Stations:—BIDEFORD, DAWLISH, DEVONPORT, DARTMOUTH, EXMOUTH, ILFRACOMBE, LISKEARD, ST. AUSTELL, WELLINGTON, DUBLIN, BRECON, CARDIGAN, PONTYPOOL, TOTNES, TRURO, &c., to either of which they refer with much confidence, and the most satisfactory testimony will be given of the manner in which the various works have been executed.

TOWNS or VILLAGES not yet supplied can be lighted with gas at a moderate cost.

PLANS and ESTIMATES furnished and Gas Companies advised on improvements, extensions, and alterations of works.

METER DEPARTMENT.

They beg special attention to the excellence and superiority of their DRY METERS, over 2000 being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

GAS-FITTING DEPARTMENT.

An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS, MEDIÆVAL FITTINGS for CHURCHES, &c.

☞ *Please note the Address*—

GAS ENGINEERING WORKS, COMMERCIAL ROAD, EXETER

WEST SURREY WATER COMPANY.

Incorporated by Special Act of Parliament.

LIABILITY LIMITED TO £10 PER SHARE.

CAPITAL—SHARES—2500 OF £10 EACH	**£25,000**
„ BORROWING POWERS	**6,000**
	£31,000

Issue of 1250 Shares of £10 each, £12,500.

Deposit on Application for Shares £1 per Share, and £1 on Allotment. Calls not to exceed £2 each per Share, and can only be made at intervals of not less than Three months.

DIRECTORS.

JOHN HOOK, Esq., Woodham Hall, Chertsey, Surrey, *Chairman.*
I. DELVALLE, Esq., Stoke Newington Green, N.
JASON GURNEY, Esq., Star Brewery, Walton-on-Thames, and Hounslow, W.
JOHN M'MILLAN, Esq., 7, Westminster Chambers, Victoria Street, S.W.
ARTHUR TELFORD SIMPSON, Esq., Cadogan Road, Surbiton, Kingston-on-Thames.

BANKERS.

THE IMPERIAL BANK, LIMITED, 6, Lothbury, E.C.
Messrs. RANSOM, BOUVERIE, & Co., 1, Pall Mall East, S.W.
Messrs. LA COSTE & STIKEMAN, Chertsey, Surrey.

ENGINEER.—E. BIRCH, Esq., M.I.C.E., 7, Westminster Chambers, S.W.
SOLICITORS.—Messrs. HOOKER & SON, 27, Great George Street, Westminster, S.W.
SECRETARY.—CHARLES ELEY, Esq., 5, Westminster Chambers, Westminster, S.W.
BROKER.—A. S. WILDY, Esq., 80, Old Broad Street, E.C.; and Stock Exchange.

AUDITORS.

WALTER F. MOATES, Esq., 28, Moorgate Street, E.C., *Public Accountant.*
(A second Auditor to be appointed at the next Meeting of the Shareholders.)

OFFICES.

5, WESTMINSTER CHAMBERS, VICTORIA STREET, WESTMINSTER, S.W.

PROSPECTUS.

"The West Surrey Water Act, 1869," secures to the incorporated Company the exclusive right of supplying the populous and increasing districts of Chertsey, Walton-on-Thames, Hersham, Oatlands Park, Weybridge, Cobham, Byfleet, and Shepperton, with Water.

These places are almost entirely dependent upon wells for their water supply, which in times of drought is liable to frequent interruption. In consequence of defective sewerage and other causes, this well water is admittedly bad, and in many instances unfit for domestic use; precarious and defective in supply, it has the further disadvantage of being attended with great expense, especially in cases where the water is required to be raised to the upper stories of dwelling-houses.

The objects of the undertaking may be briefly stated as follows, viz.:—

To supply the district with water taken from the River Thames, near Walton Bridge, where it will be passed through filter-beds, pumped into the mains, and conveyed to a reservoir to be constructed on St. George's Hill, near Oatlands Park, an altitude of upwards of 200 feet above the level of the River.

To give a constant supply, the works being so arranged that the service-pipes and reservoir will always be charged, the reservoir supplying the service-pipes when the pumps are not at work.

The reservoir is to be covered, so that the water will never be exposed to the atmosphere from the time it leaves the filter-beds until delivered to the consumer.

A provisional agreement has been entered into with the well-known firm of Messrs. Docwra and Simpson to execute these works for the sum of £23,500; and the land required can be obtained upon favourable terms.

The district contains houses of an annual value exceeding £70,000, constantly being increased by building operations; there are, in addition, railway stations, breweries, and other large establishments at present indifferently supplied with water, all of which will become consumers with great advantage to themselves and profit to the Company.

One-half of the authorized Share Capital has already been subscribed; the remainder, £12,500, is now offered to the public.

The Act of Incorporation *limits the liability of Shareholders to the sum of £10 per Share.*

The dividends paid by existing Water Companies afford the best evidence of the remunerative return which may be realized upon Capital invested in such undertakings, and few have been started with better prospects of success than this. The following is the present market price of the Shares of some of the leading Water Companies (ex dividend which has just been paid):—

	Paid per Share.	Market Price.
Chelsea	£100 0 0	£122 0 0
East London	100 0 0	122 0 0
Grand Junction	50 0 0	85 0 0
Kent	100 0 0	122 0 0
Lambeth	100 0 0	122 0 0
New River	Not obtainable.	
Southwark and Vauxhall	100 0 0	122 0 0
West Middlesex	61 0 0	113 0 0

Applications for Shares to be made in the annexed form to the Bankers, or delivered to the Secretary, at the Offices of the Company, No. 5, Westminster Chambers, Victoria Street, Westminster, S.W., accompanied by a payment of One pound per Share upon the number of Shares applied for.

Prospectuses and Forms of Application for Shares may be obtained at the Offices of the Company, or of the Bankers.

THE WEST SURREY WATER COMPANY.

No. _____

Form of Application for Shares, to be retained by the Banker.

To the Directors of the West Surrey Water Company.

Gentlemen,—Having paid to your Bankers the sum of £ , being a deposit of £1 per Share, I request that you will allot me Shares of £10 each in your Company, and I hereby agree to accept the said Shares, or any smaller number you may allot to me; and I request you to place my name on the Register of Shareholders in respect of the Shares which may be allotted to me. I am, Gentlemen, your obedient Servant,

Usual Signature _____
Name in full _____
Residence _____
Profession _____
Date _____

CATHELS & TERRACE'S Patent Four-WAY DISC GAS-VALVE is the simplest and best Valve for Purifiers, and as a By-pass for other apparatus in Gas-Works. It is always gas-tight, and has no springs, ground faces, or other delicate parts. By its use the flow of the gas cannot be accidentally stopped, and it never sticks.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, Foundry and Brass Works, ROTHERHAM.

CATHELS'S Patent District Dry Gas-GOVERNOR is the only perfect self-acting contrivance for Regulating the Pressures in the higher levels of a district.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, ROTHERHAM.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101, Cannon Street, E.C.

OXIDE OF IRON.—
We are prepared to supply, on moderate terms,
HYDRATED PEROXIDE OF IRON (BOG OCHRE),
Same quality as supplied by us to several of the most extensive Gas Companies, and which has given entire satisfaction.
FRANCIS RITCHIE & SONS,
BELFAST.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 20 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,
Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water Works, including Iron Retorts, Socket and Flange Pipes, Bends, Branches, and Syphons of all sizes, Lamp Columns, &c., &c.
N.B.—Orders for Cast-Iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention. CHARLES HORSLEY, Agent.

BELGIAN CLAY RETORTS.
J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.
Communications addressed to J. SUGG & CO., GHENT, will receive immediate attention.

INTERNATIONAL EXHIBITION, 1862.
CLASS X.
PRIZE MEDAL
For excellence of Fire-Clay Gas Retorts, and
"HONOURABLE MENTION" for
good quality of Fire-Bricks.
WILLIAM STEPHENSON & SONS,
THROCKLEY,
NEWCASTLE-ON-TYNE.

THOMAS EDINGTON & SONS,
PHŒNIX IRON-WORKS,
GLASGOW,
MANUFACTURERS OF
GAS AND WATER PIPES,
All sizes up to 4 ft. diameter;
RAILWAY CHAIRS AND SLEEPERS,
and general Castings. Also
GREGORY'S & COCKBURN-MUIR'S
PERMANENT WAY.
London Office: 63, OLD BROAD STREET, E.C.

J. T. B. PORTER & CO.,
GAS ENGINEERS,
MANUFACTURERS AND CONTRACTORS FOR GAS-WORKS
Of any extent at Home and Abroad,
GOWTS BRIDGE WORKS, LINCOLN,
AND
5, QUEEN SQUARE, WESTMINSTER, S.W.

B. CARPENTER'S
IMPROVED
WOOD SIEVES FOR GAS PURIFIERS.
WORKS:
22, HERMES STREET, PENTONVILLE ROAD,
LONDON, N.

The above Sieves are used by the principal Gas Companies in London and the country. Their utility, durability, and cheapness combined, render them superior to all others.
Testimonials from Gas Engineers who have tested their qualities forwarded on application.
All orders punctually attended to, and estimates given if required.

D. GRANT & CO.,
WET & DRY GAS-METER MANUFACTURERS.
STATION-METERS ANY SIZE,
PHOTOMETERS, EXPERIMENTAL METERS, &c.
GAS-METER WORKS, CROSS CAUSEWAY, EDINBURGH.

Now ready, demy 8vo, half bound roan, cloth sides, lettered, price 7s. 6d., by post 8s.,
THE GAS MANAGER'S HANDBOOK,
CONSISTING OF
TABLES, RULES, AND USEFUL INFORMATION
For GAS ENGINEERS, MANAGERS,
AND OTHERS ENGAGED IN THE
MANUFACTURE AND DISTRIBUTION OF COAL GAS.
By THOMAS NEWBIGGING A.I.C.E.
WILLIAM B. KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

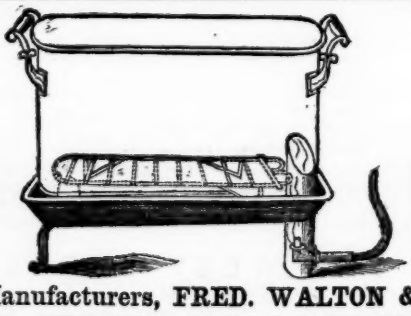
A CHECK SYSTEM OF BOOK-KEEPING FOR GAS COMPANIES.
"Mr. Charles Hight, Public Accountant, of 26, Budge Row, has brought out a work most useful to gas companies, the practical application of which will render frauds impossible. . . . It is based on a principle ensuring the best possible check on the rental and the sales, with a greatly improved method of recording the expenditure. The plan is adapted to the Board of Trade regulations for the form and details of the half-yearly published accounts of the London companies."—*Globe.*
"An admirable plan. . . . Has the merit of simplicity."—*City Press.*
For instructions and forms, apply to NISSEN, PARKER, AND ARNOLD, 43, Mark Lane, LONDON, E.C.

TO GAS COMPANIES, ENGINEERS, BUILDERS, &c.
THE PATENT ANTI-GALVANIC PAINT
Is guaranteed to prevent and arrest Rust on all Ironwork, and to cover Tar most effectually. It is most valuable for protecting it from the action of salt water, rain, sulphurous and gaseous exhalations. It has been well tested at various Gas-Works, in covering Tar on Gasholders, Purifiers, &c., and has given great satisfaction. Sample cans for trial sent free of charge. All communications to be addressed to
Messrs. STEVENS, ORCHARD, & CO., 21, Great Winchester Street, LONDON.
Sole Proprietors of Calley's "Torbay" and Chemical Paints.

SCHOLL'S
PATENT PLATINUM
GASLIGHT PERFECTER.

Extract from Report by Dr. Letheby:—
"The results have been very remarkable, for they show an average increase of 63 per cent. on the illuminating power of the gas. I am of opinion, therefore, that the invention is of great practical value."
Extract from Dr. Frankland's Course of Lectures at the Royal School of Mines, February, 1868.
"Scholl's Platinum Perfecter is one of the most important inventions of modern times in connexion with the burning of coal gas."
Price 1s. each for Fishtail Burners.
To be had retail of Gas-Fitters and Ironmongers.
JOHN SCHOLL, Manufactory: 41 & 42, BERWICK STREET;
Retail Depot: 198a, OXFORD STREET, LONDON, W.
Terms on application. N.B.—A specimen sent free on receipt of Twelve stamps.
*** Further testimonials from Drs. Frankland and Crooke, showing the great practical value of this invention, will be shortly published.

JAMES MILNE & SON,
GAS ENGINEERS,
Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,
EDINBURGH, AND
2, KING EDWARD STREET,
NEWGATE STREET, LONDON.
Station-Meters, Governors, Consumers Meters, Gas Lustres, Chandeliers, Brackets, &c., and every description of Gas-Fittings and Gas Apparatus.

SOUTHBY'S **PATENT.**
THE ECONOMIC GAS ROASTER,
WITH PERFECT VENTILATION.

Sole Manufacturers, FRED. WALTON & CO.,
OLD HALL WORKS, WOLVERHAMPTON,
AND
40, WHITFIELD STREET, TOTTENHAM COURT ROAD, LONDON.
A Joint of Meat Roasted in the highest possible perfection for One Halfpenny.
This wonderful adaptation of science to cooking is found to roast any joint of meat, poultry, or game better as well as cheaper than any kitchen range; is beautifully clean, gives no trouble, and may be used in any room where gas is laid on. The Economic Gas Roaster is absolutely free from any smell.
Prices, with Enamelled Pan complete—No. 1, 11s.; No. 2, 16s. 6d.; No. 3, 25s.
Discount to the Trade on application.

SHARES IN THE BOSTON GASLIGHT & COKE COMPANY.

MESSRS.

ALFRED REYNOLDS & ROBERT COOPER RAWLING

Are instructed to offer for Sale by Auction, at the

GUILDHALL, BOSTON,

ON

TUESDAY, the 15th day of AUGUST next,

AT ONE FOR TWO O'CLOCK P.M., PRECISELY,

From 500 to 1500

NEW SHARES OF £10 EACH

IN THE

BOSTON GASLIGHT AND COKE COMPANY,

To bear a dividend yearly not exceeding £7 per cent. per annum.

The Shares will be offered in convenient Lots, to suit purchasers, and they are issued to meet the cost of extending the Company's works.

Particulars and Conditions of Sale may be had at the Office of the Boston Gaslight and Coke Company, at the Gas-Work; at the Office of the Clerk to the Company, Wide Bargate; of Mr. ALFRED REYNOLDS, Silver Street; and of Mr. ROBERT COOPER RAWLING, Pen Street, Boston.

F. T. WHITE,

Boston, July 14, 1871. Clerk to the Boston Gaslight and Coke Company.

BOSTON GASLIGHT AND COKE COMPANY.

CAPITAL £20,000.

Statement of Accounts for the Year ending June 30, 1871.

LOAN ACCOUNT.

Temporary shareholders' loan		£6,147 10 0
Mortgage loan	£5,000 0 0	
Special loan	5,000 0 0	
	10,000 0 0	
		£16,147 10 0

REVENUE ACCOUNT.

To Coals	£3,448 14 7	By Gas-rental	£7,536 13 10
Wages for manufactory, &c.	1,271 2 1	Coke	1,360 0 4
Wear and tear	393 1 9	Tar	298 15 5
General charges	73 15 7	Lime	44 6 0
Rates, taxes, and insurance	205 18 7	Distilling account	174 12 9
Salaries	560 0 0	Sulphate of ammonia	85 18 10
Meters	164 7 1	Meters—Fixing	15 5 10
Services	43 14 11	Messrs. Gee and Co., interest	36 17 7
Lime	95 2 4		
Bad debts, &c.	41 8 1		
Carried to profit and loss	3,255 10 7		
	£9,552 10 7		£9,552 10 7

PROFIT AND LOSS.

To Dividend to June 30, 1870, at 8½ per cent.	£1,700 0 0	1870.	
Trading capital account	1,474 12 4	By Balance from last published account	£3,174 12 4
1871, Feb. 4.		1871, June 30.	
To One half year's interest on loan—£5000 —due this day	110 12 6	By Revenue brought down	3,255 10 7
Balance of profit	3,144 18 1		
	£6,430 2 11		£6,430 2 11

TRADING CAPITAL ACCOUNT.

		1870.	
		By Balance from last published account	£2,052 5 10
		Profit and loss, 1870	1,474 12 4
			£3,526 18 2

BALANCE-SHEET.

1871.		1871.	
Works	£20,000 0 0	Capital account	£20,000 0 0
Expended on new works	18,592 8 4	Loan accounts	16,147 10 0
House, shops, and boundary wall	1,262 19 8	Trading capital account	3,526 18 2
Cash at bankers £1,110 8 8		Sundry creditors for goods supplied to the company	417 14 0
Do. in hand 83 9 5	1,193 18 1	Profit and loss	3,144 18 1
Sundry debtors for gas, coke, tar, lime, &c.	1,869 15 11		
Coals, coke, and stores for stocks on hand	317 18 3		
	£43,237 0 3		£43,237 0 3

To the Directors of the Boston Gaslight and Coke Company.

GENTLEMEN,

We have examined the accounts of your Company, and find the same perfectly correct and satisfactory.

B. STORR, ACCOUNTANT.

GEORGE WISE, HY. BATES, } AUDITORS.

Boston Gas-Works, July 1, 1871.

ALFRED LASS,

ACCOUNTANT,

28, NORTH STREET, WANDSWORTH, S.W.

Mr. Alfred Lass having had considerable experience in arranging, making up, balancing and auditing gas accounts, begs to inform the Directors of Gas Companies that he may be consulted on all matters relating thereto.

Balance-sheets prepared, Accounts audited, Consultations, Agencies, &c.

BOOKS FOR GAS ACCOUNTS.

ALFRED DOUBBLE & Co., 2, Serjeants INN, and 40, FLEET STREET, LONDON, make and supply all the various ACCOUNT-BOOKS as approved and adopted by Accountants, &c., to Gas Companies.

A complete set of the Books and Forms forwarded within a few days from receipt of order.

EDWARD SANDELL, Public Accountant and Auditor, 4, Skinner's Place, Size Lane, LONDON.

The projector of the *Original Gas Companies Analyzed Expenditure Account-Book* offers his experience and services in the examination, preparation, and production of all accounts in reference to Gas Companies. References if required.

SAMUEL PONTIFEX, Consulting Gas Engineer, having retired from the Great Central Gas Company, is now prepared to furnish PLANS and SPECIFICATIONS, as well as ADVISE Provincial Gas Companies as to the erection of new, or alteration and enlargement of existing works.

Offices: 22, Coleman Street, LONDON, E.C.

ALFRED PENNY, Gas and Consulting ENGINEER,

WENLOCK IRON-WORKS,

21, WHARF ROAD, CITY ROAD, LONDON.

Mr. PENNY having had a large experience in the construction, alteration, and management of Gas-Works, begs to inform the Directors of Gas Companies that he may be consulted on all matters appertaining thereto. He also manufactures Gasholders, Purifiers, and all the various apparatus used in Gas-Works, and keeps in stock Retorts and Mouthpieces, Socket-Pipes, Bends, Branches, and T-pieces, &c., &c.

Plans, Specifications, and Estimates prepared.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 49, Parliament Street, WESTMINSTER. [Office of the JOURNAL OF GAS LIGHTING, &c.]

EDGE'S PATENT

FOR REMOVING THE

CARBONACEOUS INCRUSTATION FROM GAS-RETORTS.

"*Gas-Works, Stafford, Oct.* 24, 1870.

"My dear Sir,—In reply to your favour just to hand, I have much pleasure in bearing my testimony to the efficiency of Edge's process for removing the carbon from Clay Retorts. It has been in use at these works during the last two years, and so satisfactorily has it done its work that I should be very sorry to be without it.—I remain, my dear sir, faithfully yours,

"E. Goddard, Esq." "JOHN STORER.

For particulars and terms, apply to E. GODDARD, Sole Agent, Gas-Works, IPSWICH.

HOPKINS, GILKES, & CO.,

LIMITED,

MIDDLESBOROUGH,

SUPPLY GAS & WATER PIPES of EVERY SIZE.

Plain, Turned and Bored, and Coated.

CAST-IRON RETORTS.

Castings for Gas-Works of every description.

EXHAUSTERS.

LONDON OFFICE: 25, LAURENCE POUNTNEY LANE.

WALTER MABON & CO.,

Engineers,

ARDWICK IRON-WORKS,

FAIRFIELD STREET, MANCHESTER,

MANUFACTURERS OF

IRON TANKS, GASHOLDERS,

GAS APPARATUS,

PIPES, VALVES, IRON ROOFS,

WROUGHT AND CAST IRON GIRDERS.

DESIGNS, SPECIFICATIONS, & ESTIMATE FURNISHED.

WATER-WORKS FITTINGS,

SLUICE-COCKS, FIRE-COCKS,

METERS, STEAM FITTINGS,

GAS & HOT-WATER VALVES, &c.,

Of First-class Materials and Workmanship.

BECK & CO., Limited,

BRASSFOUNDERS & HYDRAULIC ENGINEERS,

GREAT SUFFOLK STREET, SOUTHWARK, S.E.

Illustrated Catalogues on application.

THOMAS PROUD,

GAS ENGINEER,

Invites attention to his

WOOD GRIDS

FOR PURIFIERS,

And respectfully states that he has erected improved Steam Machinery for their manufacture, and devotes great care to supply Grids which will give satisfaction.

He also solicits attention to his

IMPROVED GAUGE

which indicates pressure or vacuum in ONE TUBE. Having but one joint, the Gauge can be taken asunder, cleansed, and refixed in a few minutes.

Plans and estimates furnished for improvement of existing, or for the erection of new Gas-Works.

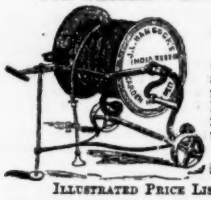
Gas Apparatus Manufactory,

7, UNETT ST., ST. GEORGE'S,

BIRMINGHAM.

HANCOCK'S INDIA-RUBBER HOSE-PIPES,

FOR WATERING GARDENS, LAWNS, &c.



Made in 60 ft. lengths, and best make only.

Brass branches, with stop-cocks, jets, and spreaders, and union joints for connecting any size Hose. HOSE REELS (galvanized iron or painted) for winding up the Hose.

Orders promptly executed, and

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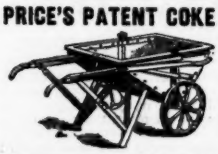
PRICE'S PATENT COKE & COAL BARROW,



effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

THOMAS LAMBERT & SONS,

SHORT STREET, LAMBETH, LONDON

PATENTEES OF THE

HIGH-PRESSURE EQUILIBRIUM BALL VALVES AND DIAPHRAGM BIB & STOP VALVES,

MANUFACTURE EVERY DESCRIPTION OF

GAS-JOINTS, CHANDELIERS, PENDANTS, BRACKETS, ETC.;

WROUGHT-IRON WELDED TUBE AND FITTINGS,

BLACK AND GALVANIZED;

BRASS, COPPER, LEAD, TIN, AND COMPOSITION TUBING,

STOCKS, TAPS, AND DIES,

And Every Description of Gas-Fitters Tools;

IRON MAIN COCKS, WITH WHITE METAL PLUGS;

GAS SLIDE AND SLUICE VALVES;

CARTER'S SAFETY GAS-VALVES;

GAS-STOVES, REGULATORS, BURNERS, &c.,

Large Pattern-Book and Price List of Gas-Fittings, price 7s. 6d., supplied on application.

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(Established 1820,)

FIRE-BRICK AND TILE MERCHANTS,

Wholesale and for Exportation,

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SOUTHWARK, LONDON, S.E.,

DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for

GAS AND WATER WORKS.

SAM. CUTLER & SONS,

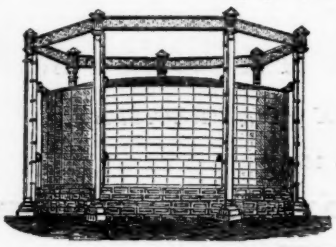
CONTRACTING GAS ENGINEERS,

GASHOLDER & GENERAL GAS APPARATUS MAKERS,

MANUFACTURERS OF

BOILERS, IRON ROOFING, IRON BRIDGES,

AND GENERAL IRONWORK.



S. C. AND SONS undertake Contracts of any magnitude for the **Erection of new and Remodelling of existing Gas-Works**, for **Gasholders, Cast and Wrought Iron Tanks, Iron Roofs**, and every description of **Apparatus** for the Manufacture and Distribution of Gas.

Special attention is invited to their **"Improved Condenser,"** which is very effective, and much approved; also to their patterns of **Annular** and other **Condensers, Scrubbers**, and **Purifiers**, of all sizes, which they arrange either with **Centre** or Ordinary **Slide Valves.**

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S. C. AND SONS undertake the **Supply** and **Laying of Mains** for **Gas and Water**, and supply all Castings, Connexions, and Fittings for Retort-House, Works generally, and for Streets. They also supply **Valves** of all descriptions, Iron and Clay Retorts, Hotpressed Retort-Lids, Steel Charging-Scoops of improved make, for which they have special machinery, Improved Coke and Coal Barrows, Cross-Bars and Screws, Bolts and Nuts, Furnace and Stoking Tools, Iron and Wood Purifier-Sieves, Lead, Yarn, Borings, &c., including every requisite whatsoever for a Gas-Work, a well-assorted stock being kept of those goods most in request.

SOLE MAKERS OF BRETT'S PATENT COKE BARROW.

Experienced Retort Setters sent to any part of the Kingdom.

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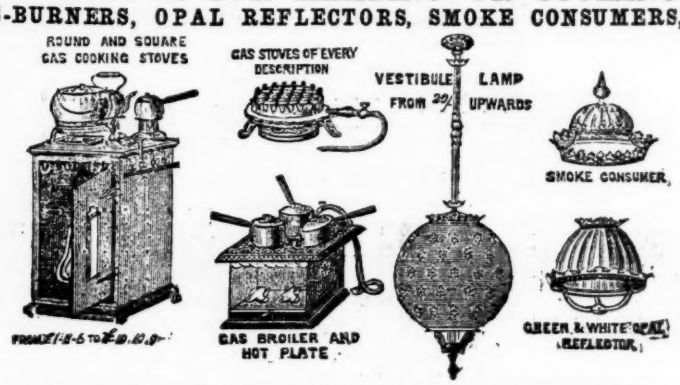
MANUFACTURERS TO THE TRADE

OF EVERY DESCRIPTION OF

GAS-STOVE FOR HEATING OR COOKING,

GAS-BURNERS, OPAL REFLECTORS, SMOKE CONSUMERS, &c.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GAS STOVES OF EVERY DESCRIPTION
VESTIBULE LAMP FROM 22/ UPWARDS
SMOKE CONSUMER
GAS BROILER AND HOT PLATE
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Pattern-Books, with Prices and Discounts, sent free on application.

REDUCED PRICES

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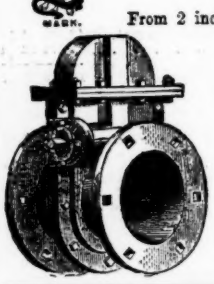
IMPROVED GAS-VALVES

WITH WROUGHT-IRON PINIONS,

From 2 inches to 18 inches, price 9s. 6d. to 12s. per inch diameter.



List of prices, with full dimensions of all sizes up to 48-inch, to be had on application.

These Valves are all proved on both sides to 30 lbs. on the square inch before leaving the works, and are always kept in stock.

VALVES MADE WITH OUTSIDE RACKS TO ORDER.

ALSO,

SCREW WATER-VALVES WITH GUN-METAL FACES.

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GENERAL ENGINEERS AND IRONFOUNDERS,

MAKERS OF STEAM-ENGINES,

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THE PATENT RIBBED GAS-RETORTS

Are in Use at over 150 Gas-Works,

And continue to give entire satisfaction. Circulars, with prices and testimonials, will be sent on application to

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ESTABLISHED 1827.

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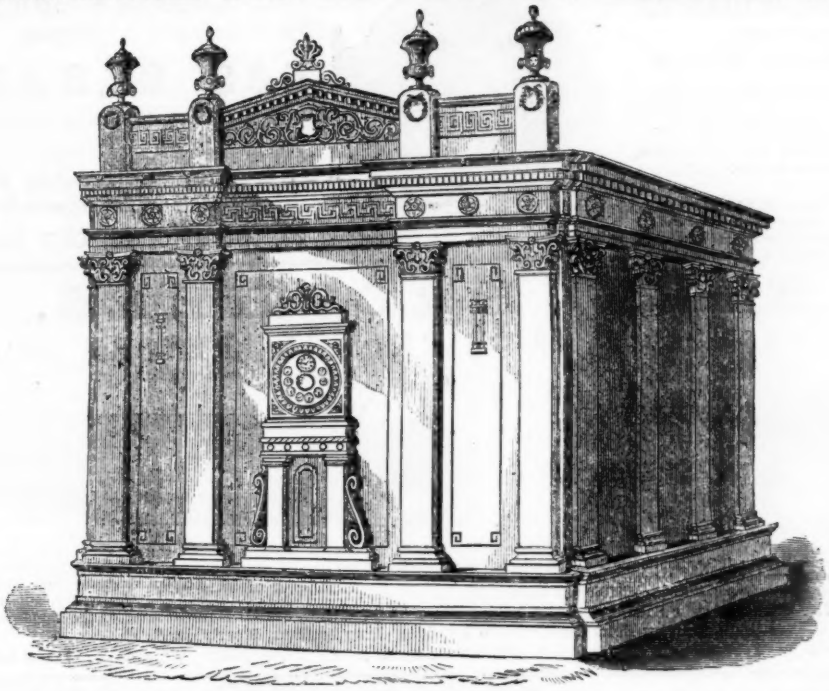

W. & B. COWAN'S SQUARE STATION-METER with PLANED JOINTS.

GOVERNORS, PRESSURE REGISTERS, TEST GASHOLDERS, GAUGES, &c.

W. & B. COWAN'S DRY GAS-METERS, in CAST-IRON CASES,

Possess a simplicity of construction and facility for repair greater than any yet produced, while the excellence of the material and workmanship, and accuracy of registration, cannot be surpassed. The superiority of their Dry Meters in Tin Cases is also well known, having stood the test of years.

PRICE LISTS ON APPLICATION.

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WOOD SIEVES FOR PURIFIERS

Have now been in use for more than ten years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

Midland Iron-Works, Donnington, near Newport, Shropshire; 8, Finsbury Circus, London.

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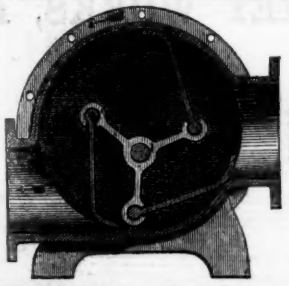
GOVERNORS, GAUGES, INDICATORS, EXHAUST & PRESSURE REGISTERS,
GAS STATION-METERS,
With all the joints planed.
TERMS, &c., ON APPLICATION.



CHARLES HORSLEY'S
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GAS EXHAUSTER.
(From 250 Feet upwards per Hour.)
Also,
ROTARY TAR AND OIL PUMPS.
For particulars and prices apply to the Patentee,
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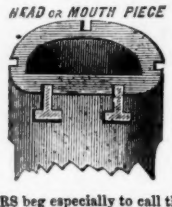

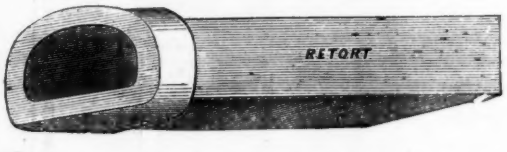

KING BROTHERS beg especially to call the attention of Gas Companies to the superiority of their Retorts, which are made from the celebrated STOURBRIDGE FIRE-CLAY. Mr. King has patented a Kiln for burning Retorts, by which Patent all Cold Air is excluded from the Kiln while burning, thus rendering them FREE FROM CRACKS AND CORRECT IN FORM. By great care in Manufacturing, combined with the advantages in burning, a VERY SMOOTH SURFACE is obtained, rendering them less liable to carbonize.
Retort Ovens, Fire-Bricks, Guards, Saddles, Rabbitted Burs, Flues, and Quarries, are all Manufactured of the same quality of Clay.
Every Retort and Brick is branded "King Brothers, Stourbridge."
Agent in Ireland—Mr. JAMES FURNESS, No. 3, FOWNES STREET, DUBLIN.

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CONSTRUCT THE LARGEST SIZED
GASHOLDERS, TELESCOPE AND SINGLE-LIFT,
Midland Iron-Works, Donnington, near Newport, Shropshire; 8, Finsbury Circus, London.

CAROLINE VICKARY,
(ADMINISTRATRIX TO THE LATE JOHN VICKARY,)
GAS ENGINEER, CONTRACTOR, IRON AND BRASS FOUNDER,
EXE ISLAND, EXETER,
(Established Thirty years,)

Respectfully tenders her thanks to those friends who have patronized her since her late husband's death, and having secured an efficient staff for each department of design and manufacture, she refers with confidence to works recently erected by her as a guarantee that all orders she may be favoured with will be completed in a sound and satisfactory manner.

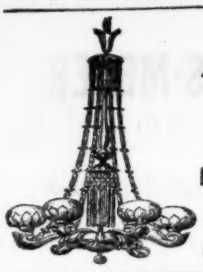
GASHOLDERS AND TANKS,
Retorts, Retort-Fittings, Condensers, Scrubbers, Purifiers, Station-Meters, Governors, Sluice-Valves of all kinds. (Gas and Water Mains always in stock.)

GAS-FITTINGS,
Including Chandeliers, Pendants, Hall Lamps, Brackets, Star and Sun Lights of all designs, embracing the Mediæval and other periods.

GAS-METERS (WET OR DRY),
Combining the most recent improvements in principle and manufacture; upwards of 150,000 already in work, giving the highest satisfaction. (A guarantee for five years given with each one.)

Every description of **Plumbers Work,** comprising **Water-Closets, Beer-Engines, Lift and Force Pumps, Cocks for Gas, Water, or Steam, &c.**

Drawings, Specifications, and Estimates of **Gas-Works, Iron Roofs, Bridges,** and light or heavy structures in wrought or cast iron, supplied on application.



F. & C. OSLER,

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MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

WALTER FORD,

159, GRAY'S INN ROAD, LONDON,

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WET & DRY GAS-METERS, STATION-METERS, GOVERNORS, &c.

SOLE MANUFACTURER OF

PADDON'S PATENT STREET-LAMP REGULATORS,

For ensuring any required consumption. These Regulators are in general and increasing use, and references can be given to Gas Companies who use them for every Lamp.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

19, NORTHUMBERLAND STREET, STRAND, W.C.

MR. ANDERSON advises Companies on all matters connected with the manufacture of Gas and the construction of Works.

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS, heated by tar without the production of smoke.
STEAM-ENGINES and EXHAUSTERS, separately or combined.
FOUR-WAY VALVES, one of which is equal to three ordinary Valves.
STATION GOVERNORS—the Gasholder cannot tilt and cause accident.

BREEZE AND TAR FUEL MACHINE.

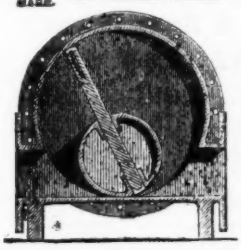
A Pamphlet containing Eighteen Illustrations of the foregoing, with letterpress on the construction of Works, post free, 2s. 6d.

N.B.—The second edition of this Work, *now ready*, contains illustrations of the Machine for converting Breeze and Tar into Fuel for heating the Retorts.

"The Author is well qualified to speak authoritatively upon the important subjects to which his pamphlet refers."—*Artizan.*

TRADE MARK

J. BEALE'S PATENT GAS EXHAUSTER.



BEALE'S CONTINUOUSLY ACTING

GAS EXHAUSTERS

ARE NOW MANUFACTURED BY

B. DONKIN & CO.

MR. J. BEALE, of East Greenwich, having retired from business, has made an arrangement with B. DONKIN & CO. for the sole manufacture of his Patent Solid-Slide Gas Exhausters.

B. D. & Co. also make Steam-Engines to drive Gas Exhausters direct or otherwise.

Estimates and Prices on application to

B. DONKIN & CO.,

ENGINEERS & IRONFOUNDERS,

BERMONDSEY, LONDON, S.E.

TO GAS COMPANIES AND THE TRADE.

J. DEFRIES & SONS,

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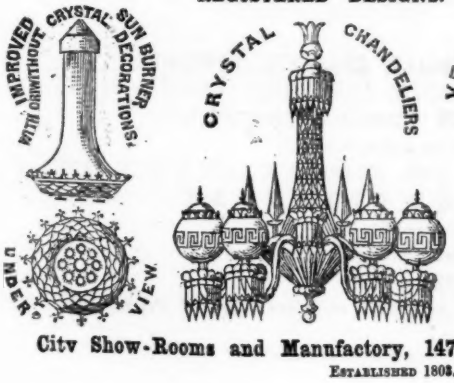

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Lochore seam	11,351	37·06	0·33	1414	52	12
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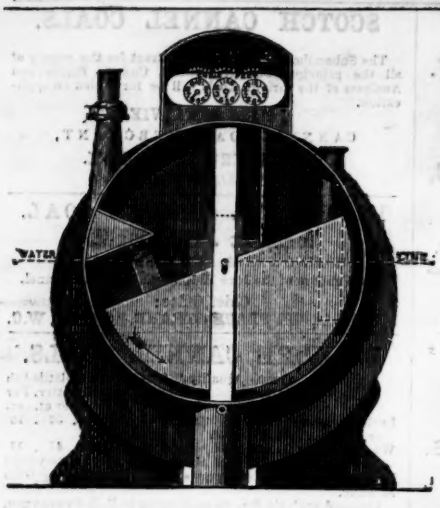

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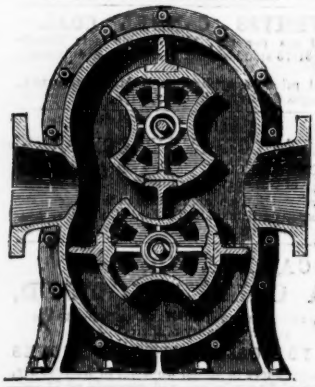

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